Nokia Customer Care
RH-29 Series Cellular Phones

6a - Baseband Troubleshooting

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Introduction to RH-29 Troubleshooting

This document is intend to be a guide for localizing and repairing electrical faults in the RH-29 device. First there is a brief guide for fault localizing. Then fault repairing is divided into troubleshooting paths.

Before any service operation you must be familiar with the RH-29 product and module level architecture. You have to also be familiar with the RH-29 specified service tools such as the Phoenix service software, flashing tools and software.

General guidelines for RH-29 troubleshooting

Tools needed for troubleshooting

- Service tools (as listed at service tools chapter in service manual)
- Laboratory power supply with current indicator
- Oscilloscope
- Digital multimeter

General guidelines

If the device cannot be turned on by any means, see "dead device" troubleshooting

Current consumption (missing consumption) gives an idea whether the device is able to start up.

Dropping supply voltage or very large current consumption indicates a short circuit

Check whether the connection with Phoenix works and what can be discovered with Phoenix (ADC-readings, baseband self-test, BB-calibrations etc.)

Check baseband self-tests with Phoenix if "CONTACT SERVICE" is shown on the display.

Check visually display and rocker faults.

Force phone to LOCAL mode and make keyboard test by phoenix.

Check that board-to-board connector is OK, and connectors make good contacts.

If liquid damage, stop repairing!

Flash the phone before disassembling it, if the fault is not obvious and the Phoenix connection is OK.

Disassemble phone:

Try to locate failed module.

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Check failed module visually:

Mechanical damages?

Solder joints OK?

Continue with specific troubleshooting procedure for the module:

If there is an obvious fault, repair it before reflashing the device.

Flash first if a fault is not obvious.

If flashing is not working go to flashing troubleshooting.

Due to CSP packages short circuits or broken solder joints are not easily seen. If the examined signal seems to be continuously in low or high level, then measure for possible short circuit to ground (signal low) or to supply voltage (signal high) Note that if a problem is not found from any visible contact/component it can be under CSPs where the signal is connected.

Care must be taken when assembling and disassembling the transceiver. Failure to do this may result in unnecessary damage to device.

Nominal current consumption

NOTE: Service tools need some amount of current to work.

The following current consumption values are measured from a complete RH-29.

Vbatt = 3.6V

Measured nominal currents are drawn from the main battery.

Measurements have been made with a current probe connected to an oscilloscope.

Operating mode	Current consumption
Idle	90 mA
2w audio call (backlights off)	250 mA

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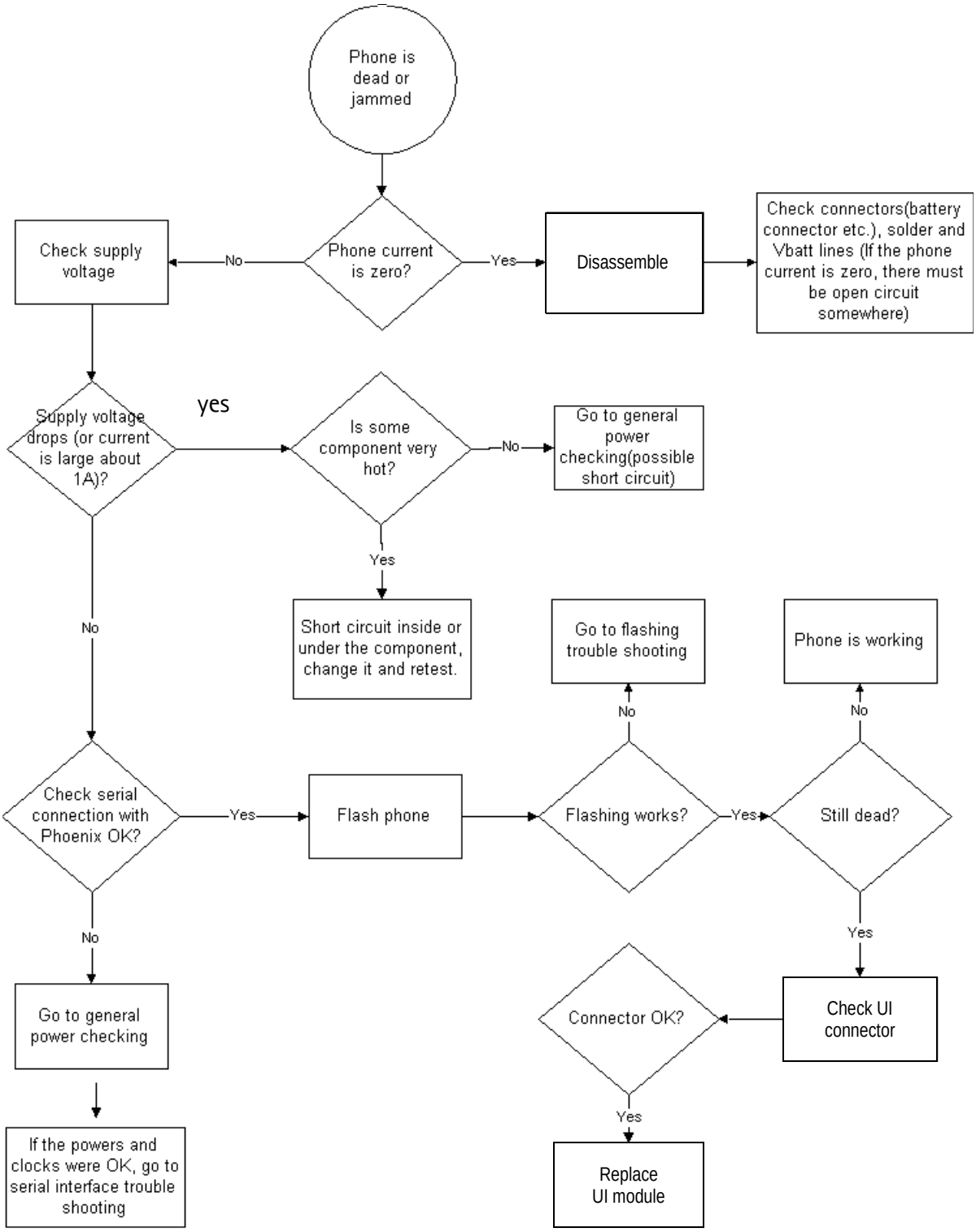
Troubleshooting Paths

Dead or jammed device



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Partially damaged device

If the device is working, but some functionality is missing try to localize where the problems is and see relevant part of this manual. E.g audio is not working see "Audio Troubleshooting", if charging is not working see chapter Charging troubleshooting etc.

Most common symptoms reported by customer

In this chapter is described most common symptoms reported by customers when the device is brought in for service. Some tips where the trouble can be found are given also. When troubleshooting use these tips and follow the given troubleshooting path.

Most common symptoms for audio problems

"Earpiece sound is missing"
"Handsfree sound is missing"
"Headset is not recognized"
"Microphone is not working"
"Volume cannot be adjusted"
" Ringing tones does not work"
"Audio volume too low"

If symptom is something like above see audio troubleshooting.

Symptoms related to energy management

"Phone does not stay on"
"Charging is not working"
"Time is lost during battery change"
"Charging takes too long"
"Operating time is very short"

These symptoms lead to relevant part of energy management troubleshooting

Problems related to UI module:

"UI-module keypad is not working"
"Backlight is dim"
"Backlight not even"
"Backlight is blinking"
"Keypad or display backlight is not working"
"Display related problems"

See UI- module troubleshooting.

Most common RF related symptoms:

"Call cannot be made"
"Phone does not find signal"
"Call is often dropped"
See RF troubleshooting

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ASIC is changed

ASIC's can be changed only at a defined service level.

UEM changed

If UEM is changed baseband calibrations should be made. New IMEI must be programmed also. ZOCUS calibration is not necessary.

UPP_WD2 changed

IMEI must be reprogrammed.

ZOCUS changed

Zocus must be re-calibrated

Test points

Test Point	Signal	Test Point	Signal	Test Point	Signal
J109	UEMInt	J203	TXQD	J477	SIM IF
J123	SLEEPCLK	J204	AUXD	J482	MMC IF
J124	SLEEPX	J311	FLASH CE	J483	MMC IF
J125	PURX	J312	FLASH CE	J484	MMC IF
J170	RFCLK_I	J314	SDRAMCLK	J485	MMC IF
J190	EARDATA	J315	FLASH CLK	J487	MMC IF
J191	MICDATA	J334	Shutdown Audio PA	J488	MMC IF
J192	SIMIODAI	J390	Current sense resistor	J490	MMC IF
J193	SIMCLKI	J391	Current sense resistor	J492	MMC IF
J194	SIMIOCTRL	J392	Current sense resistor	J493	MMC IF
J195	MBUSTX	J393	Current sense resistor	J495	MMC IF
J196	MBUSRX	J470	SIM IF	J496	MMC IF
J197	FBUSTXI	J471	SIM IF	J497	MMC IF
J198	FBUSRXI	J472	SIM IF	J498	MMC IF
J199	RFCONVCLK	J473	SIM IF	J499	MMC IF
J200	RXID	J474	SIM IF		
J201	RXQD	J475	SIM IF		
J202	TXID	J476	SIM IF		

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"CONTACT SERVICE" on display

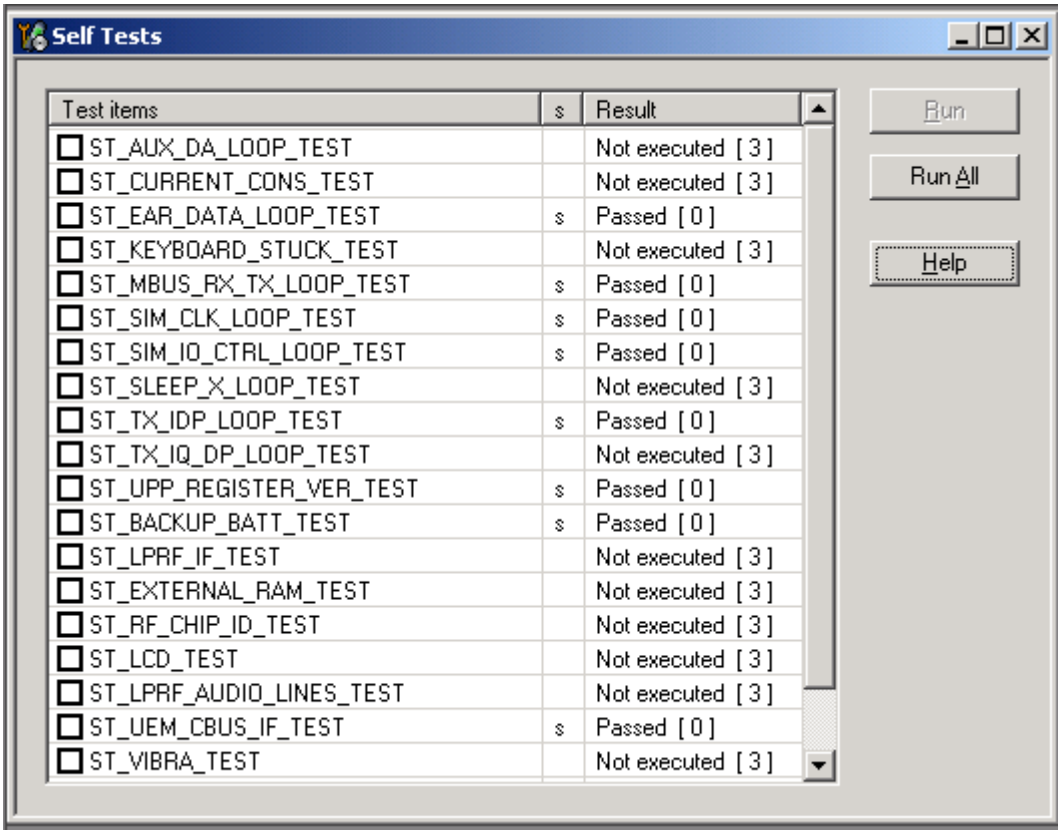
CONTACT SERVICE on display (Self-tests by Phoenix)

Display information: **"Contact Service"**

This fault means that software is able to run and thus the watchdog of UEM can be served.

Self-test functions are executed when the phone is powered on and if one or more self-test functions fail, the message "Contact Service" is shown on the display.

MCU self-test cases can be split into two categories: The ones that are executed during power up and the ones that are executed only with a PC connected. These test and the items included are as follows:



If some self-test failed, see relevant chapter in this troubleshooting document.

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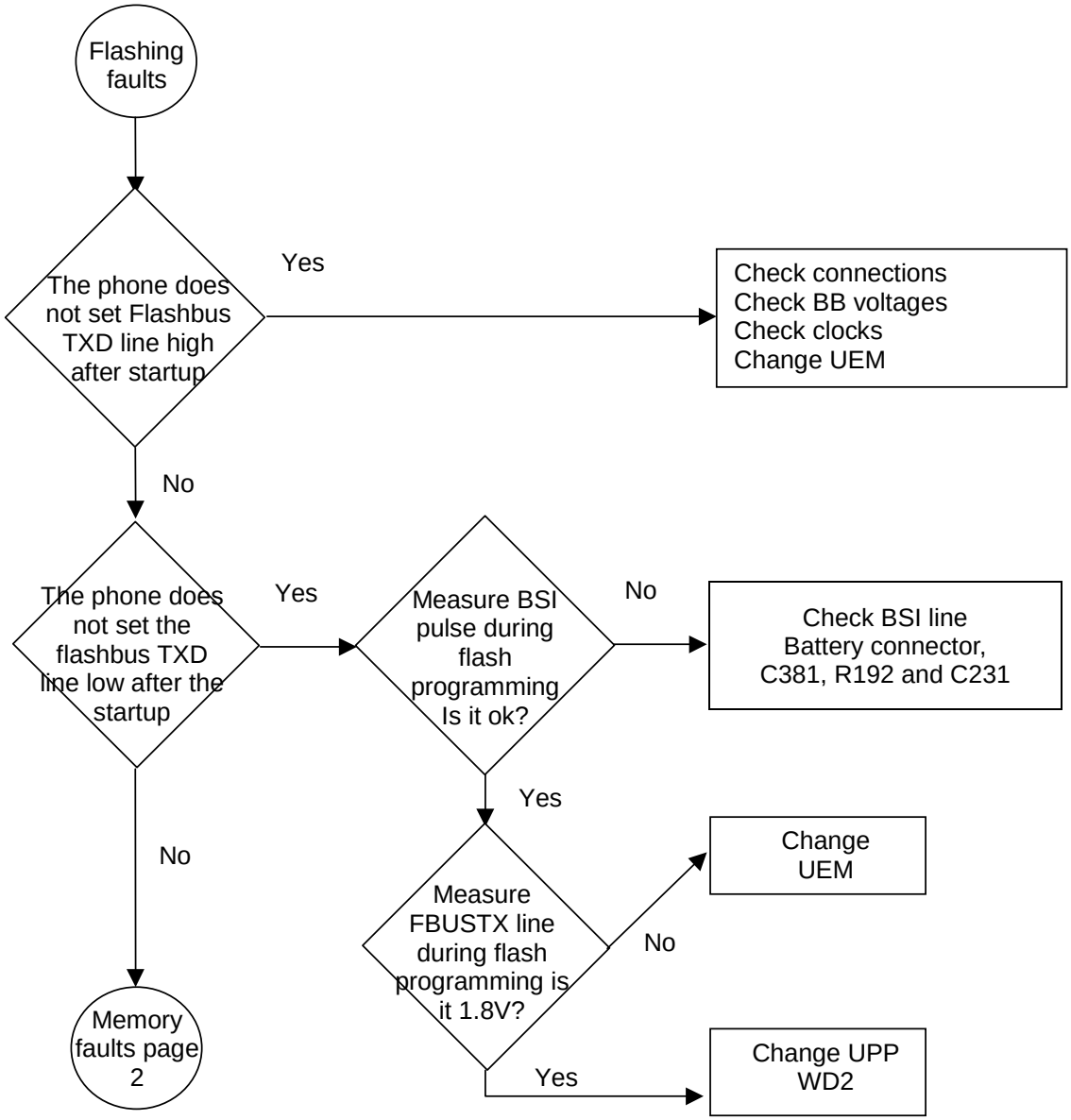
1CK Baseband HW Subarea Troubleshooting

Flashing troubleshooting

RH-29 has three memory components installed on the main PWB. The best indication of which one is causing problems can be obtained by flashing the device. It has to be kept in mind that all three flashes are interfaced with UPP WD2 asic that might it self have some problems. The necessary steps are described below. Phoenix error messages during flashing greatly help on defining what is wrong. To be able to flash the device, most device BB area components must function properly.



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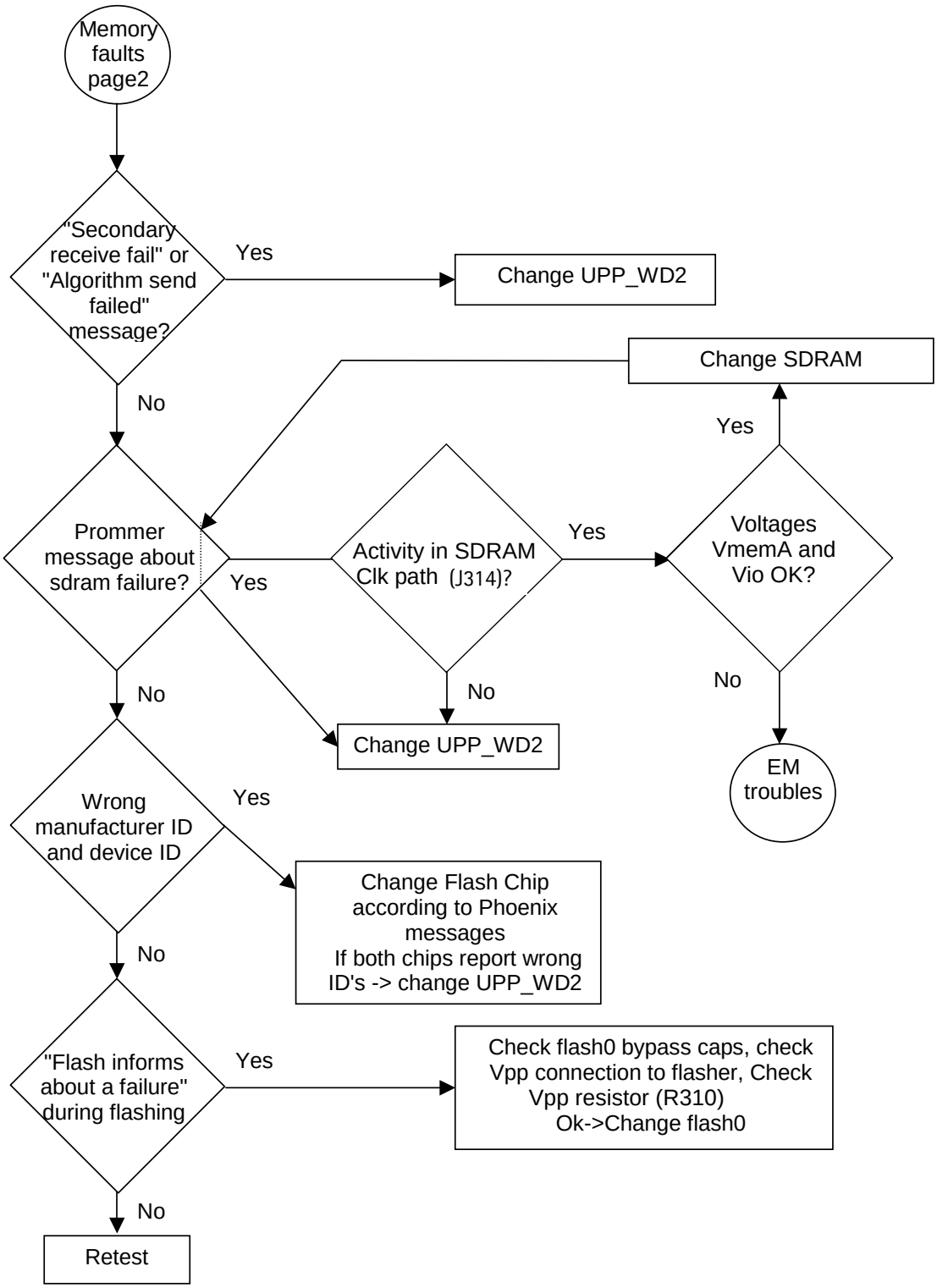

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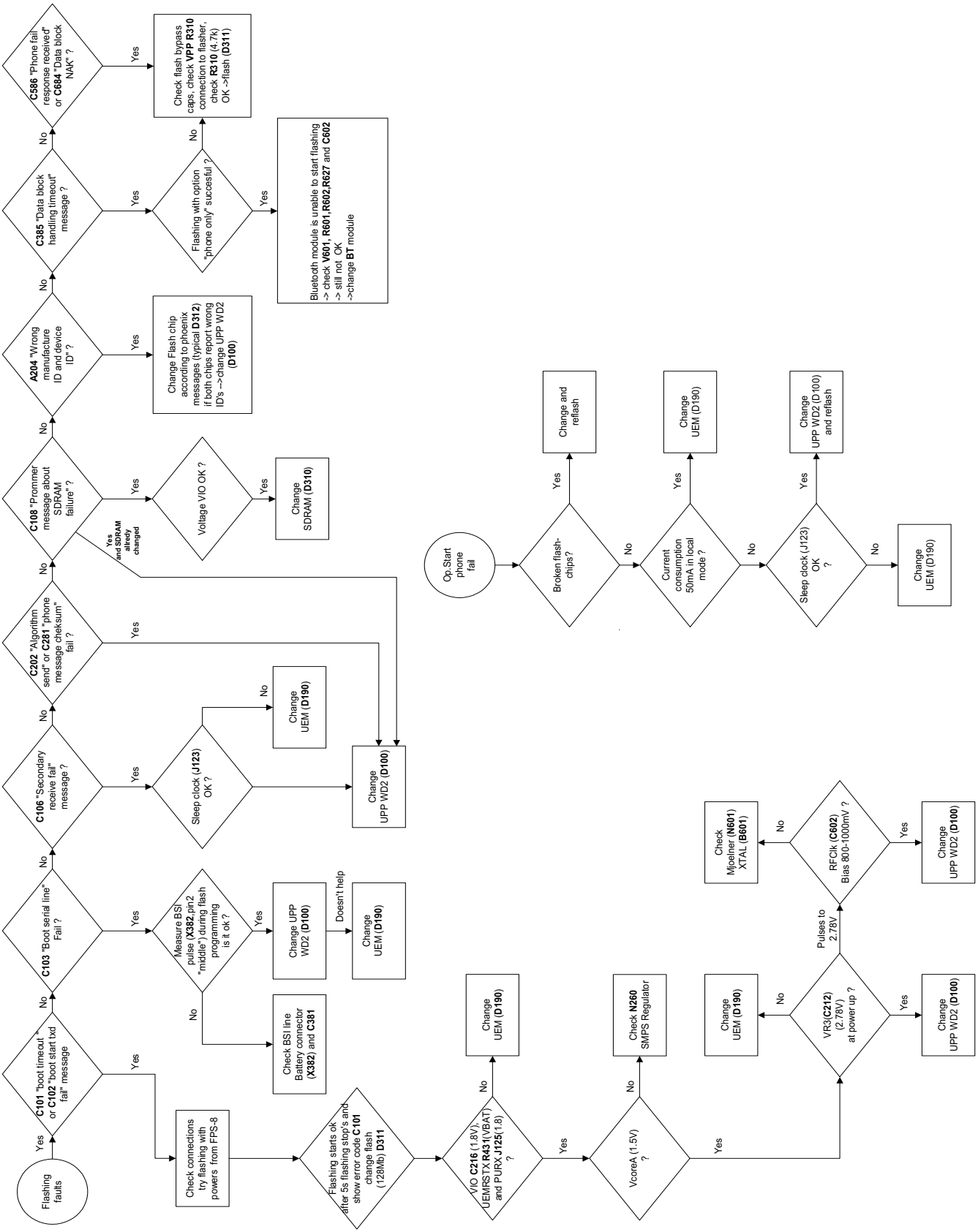

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Energy management troubleshooting

Device does not stay on

If the device is switched off without any visible reason, there may be problems in the following areas:

- UEM watchdog problem (WD is not updated by SW)
- BSI line problem (BSI line is floating => contact failure)
- Battery line problem
- Soldering problem

The most likely reason is UEM WD (watchdog), which turns the device off after about 32 seconds if SW is jammed.

This may caused by SW problem, UPP_WD2 problem (Not server by SW), UEM or memory malfunctions.

The following tests are recommended:

- General power checking
- Clocks
- Memory testing
- Serial Interface

If there is something wrong in BSI line, the device seems to be dead after the power key is pressed. However the regulators of the device are on a few seconds before the power-down.

This mode can easily be detected from the current consumption of the device. After a few seconds the current consumption drops almost to 0 mA.

In this case check component or soldering

- Battery connector X382
  EMI-filter R381
  UEM D190 (pin number C2)

If phone boots to TEST or LOCAL mode with normal battery, BSI is short circuited to ground. Check EMI-filter and filtering capacitors, which are located to BSI.

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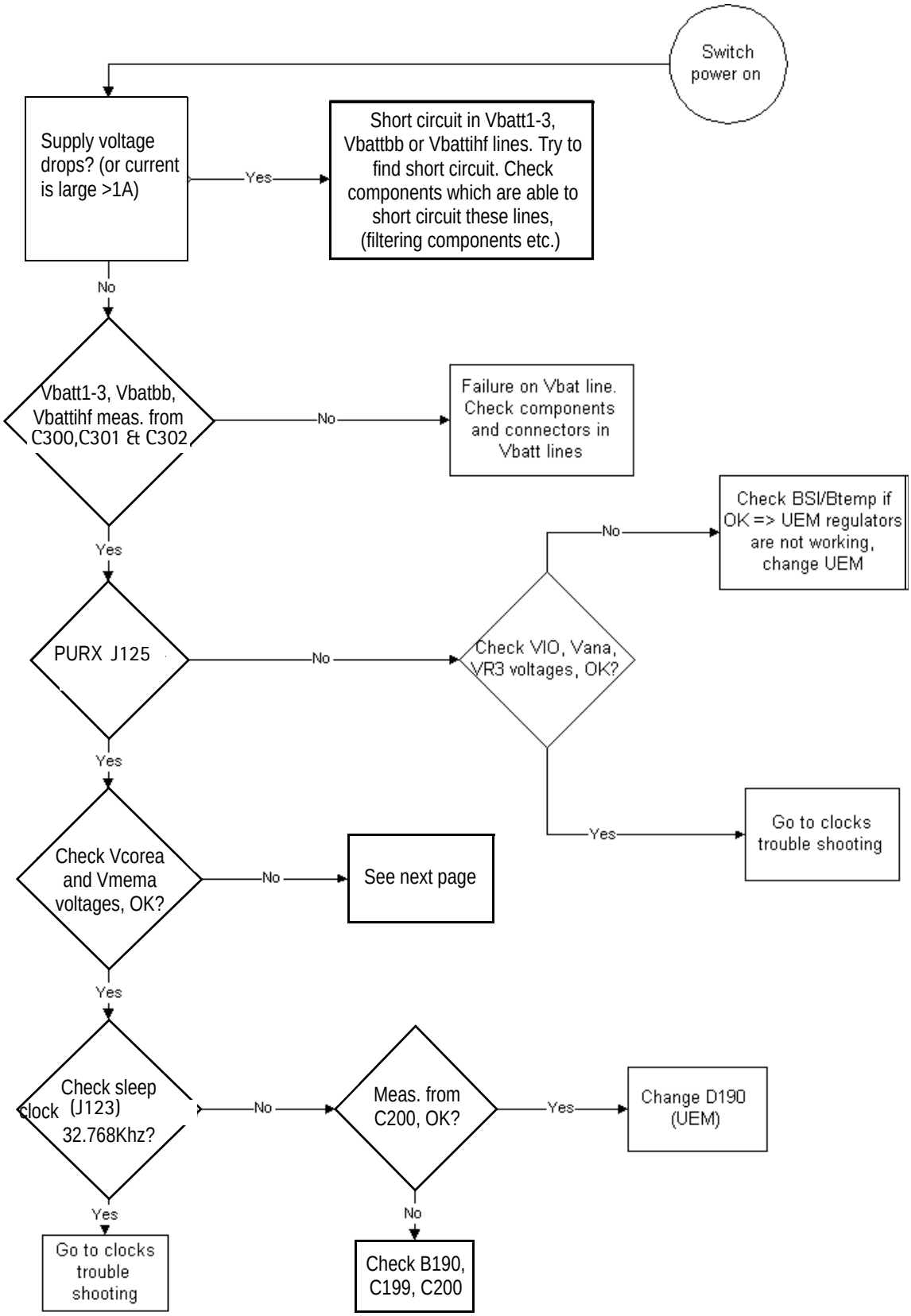
General power checking

Use service tool SF-20. Battery voltage should be at least 3.6V. After phone disassembly, use module jig MJ-21.



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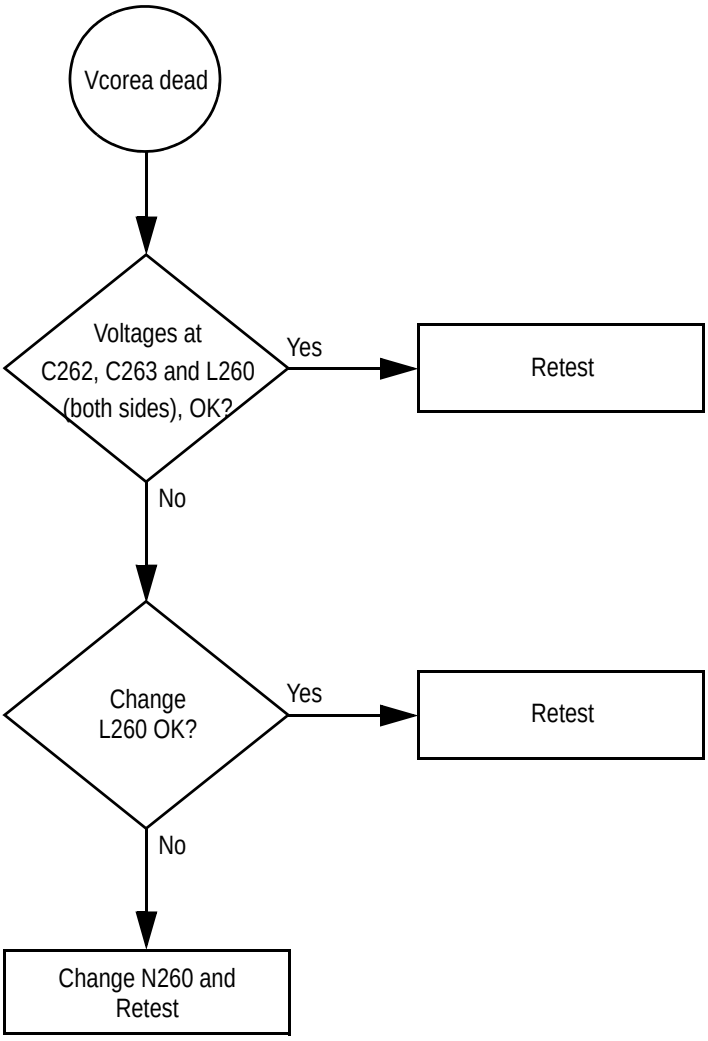

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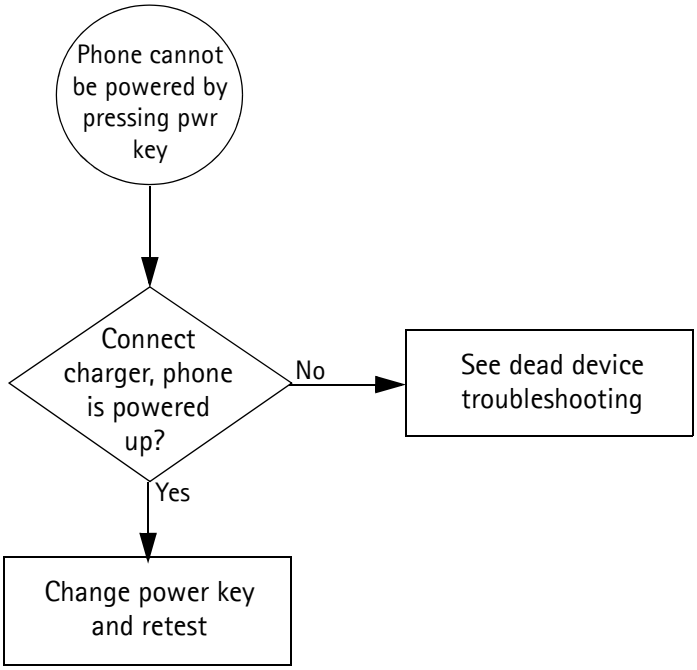
Power key troubleshooting



Clocks troubleshooting

Clocks include the following:

- RF-clock
- DBUS, CBUS clocks
- Flash and SDRAM clocks
- Sleep clock
- Bluetooth clock
- SIM clock
- MMC clock

The main clock signal for the baseband is generated from the voltage controlled crystal oscillator VCXO. This 26 MHz triangle wave clock signal is supplied to OSC_IN pin of Mjoelner and out to UPPWD2. Inside UPPWD2 the clock frequency is divided to 13 MHz

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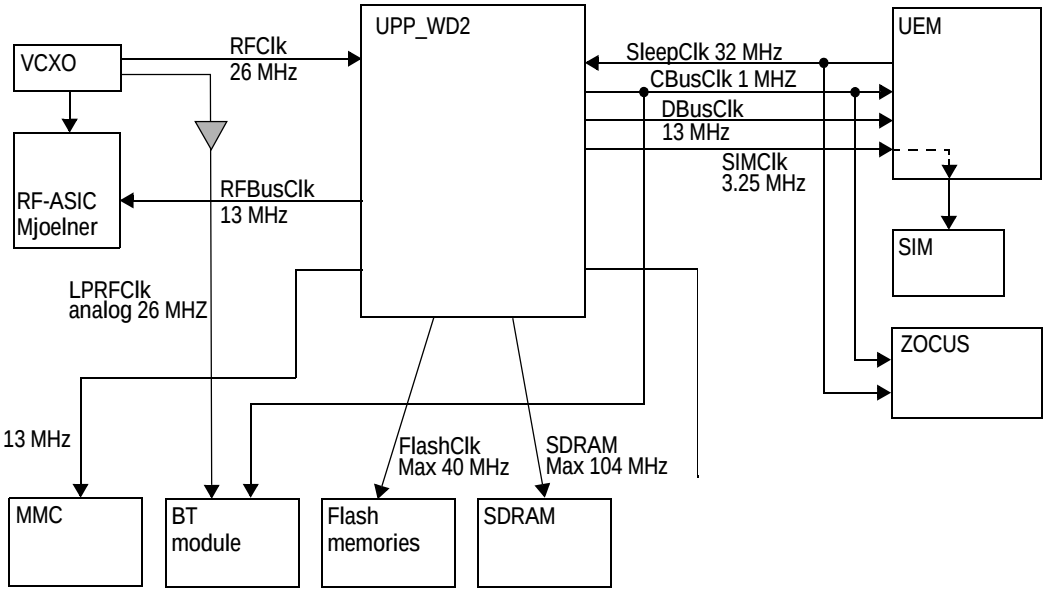
and then fed to RFCLK.



In SLEEP mode the VCXO is off. UEM generates low frequency clock signal (32.768 kHz) that is fed to UPP_WD2, Bluetooth and ZOCUS.

When the flashing of the device does not succeed, but powering is OK, follow these instructions.

Note: The absence of clocks may indicate that the device (put phone to LOCAL mode when the sleep is not allowed or press buttons so that phone is not in sleep mode) is in sleep mode. Make sure that the device is not in sleep during clocks measuring.

IMPORTANT: Clock signals have to be measured with 1MΩ (or greater) probes!

Measure signal from J170. This should be 26Mhz clock signal. See RF Troubleshooting for further information.

Check the crystal oscillator (B190) is oscillating at 32.768kHz frequency. If not change B190. If OK measure sleepclk from J123. Frequency should be the same 32.678kHz (see Figure 1, “Sleep clock,” on page 17 below.) If not change UEM.

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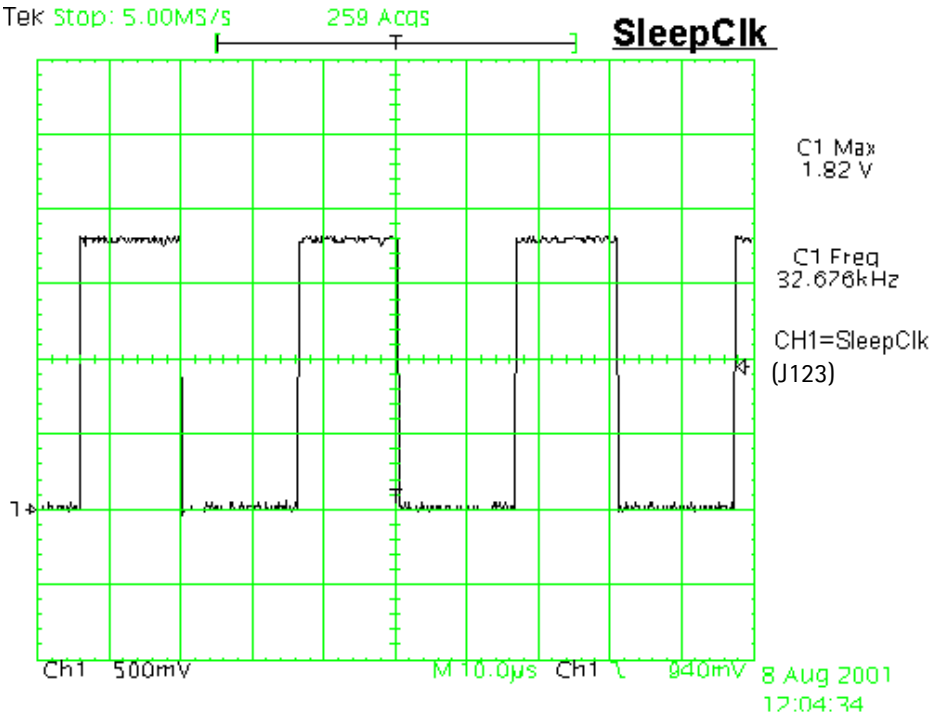
Figure 1: Sleep clock



Charging checking

Use the BL6-C battery and JBV-1 calibration set to test charging. (NOTE: power supply cannot be charged if it not has a current sinking capability.) When you are charging totally empty battery, remember that start-up charging might take a little bit longer time than normal. During this time display is blank.

If charger is not NMP approved type and its current and voltage is not within NMP charger window then software does not start charging and there is "NOT CHARGING" on the display. Voltage should be between 5.3V - 9.5V and current between 200mA – 900mA

Remove and reconnect battery and charger few times before you start to measure device. This check ensures that the fault really exists.

(Refer to "Charging troubleshooting")

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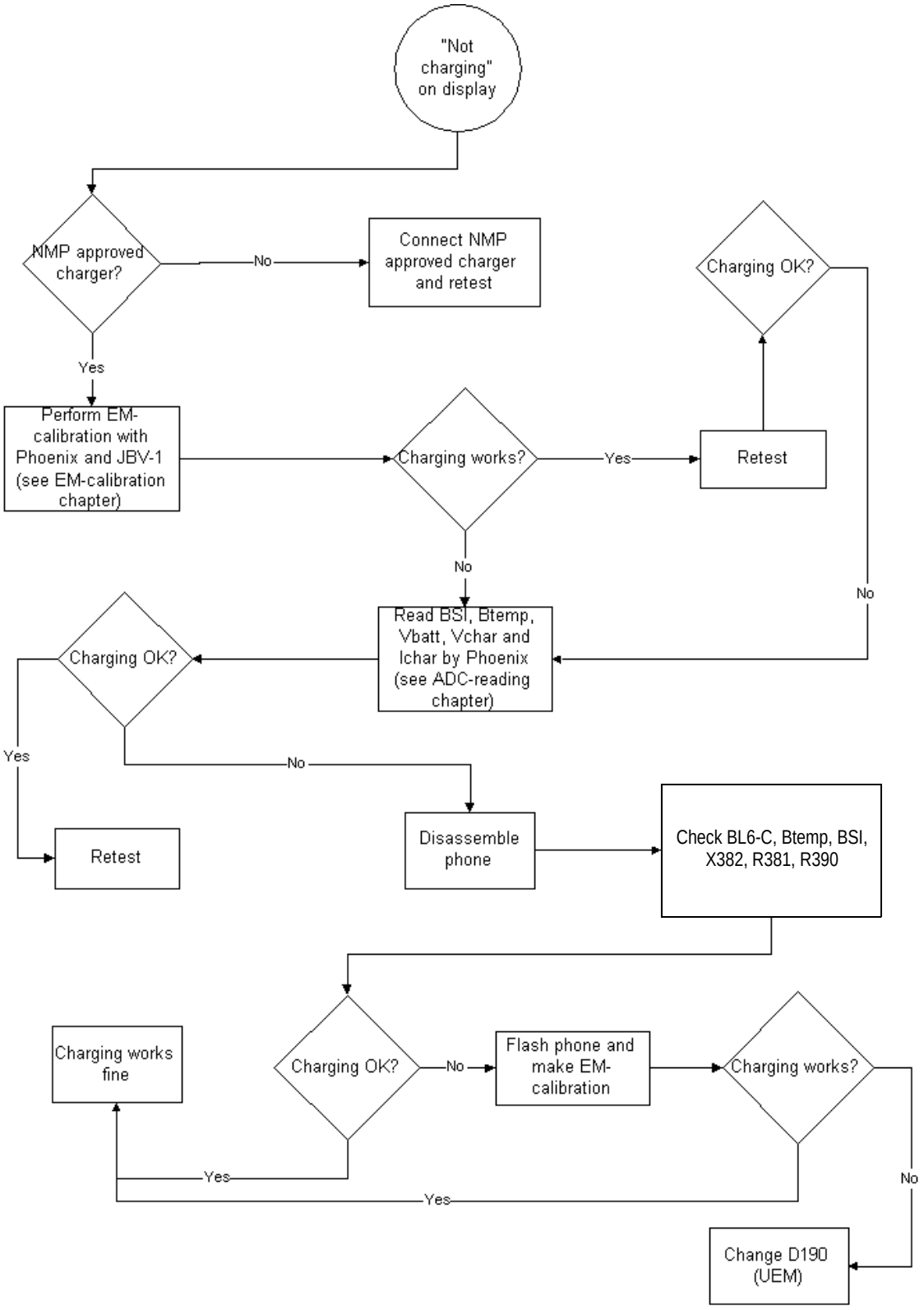
Figure 2: Charging troubleshooting



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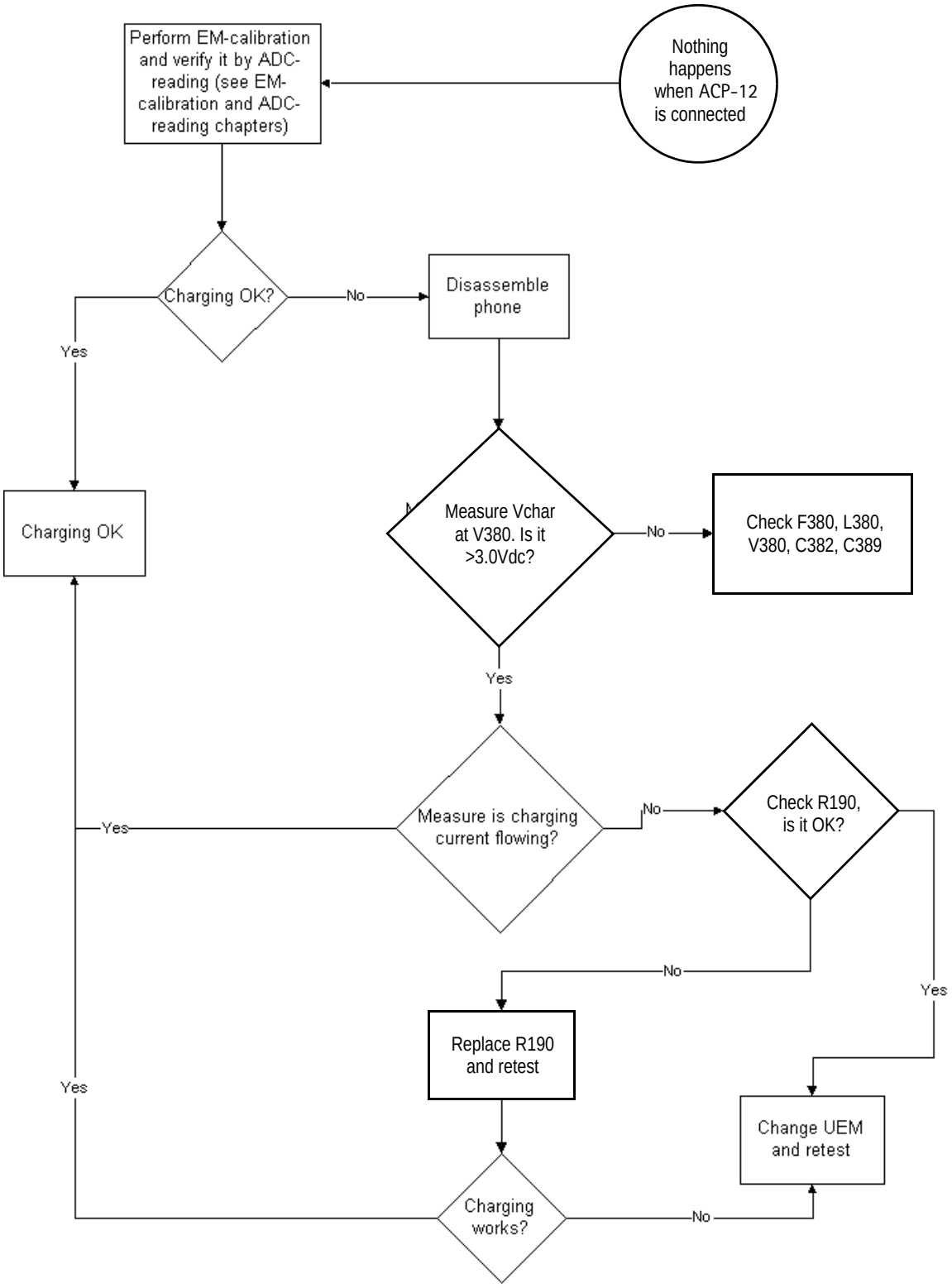

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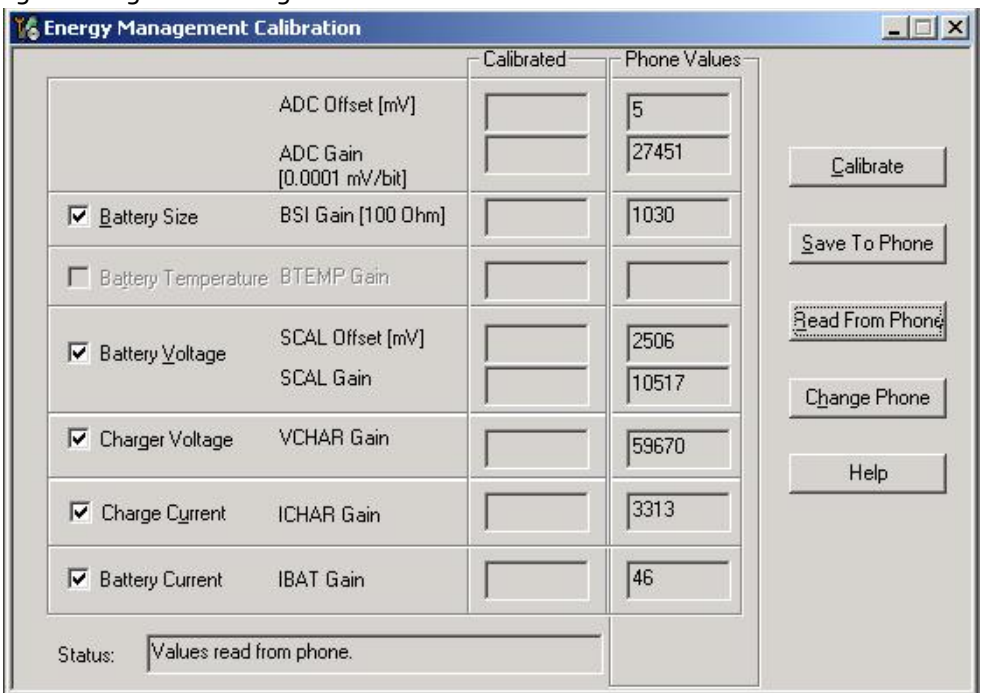
Energy management calibration

During energy management calibration A/D-converter, BSI, Btemp, Battery voltage, Charger voltage and Charger current are calibrated.



Limits for calculated calibration values are as follows:

Channel	Low	High
ADC Offset	-50	50
ADC Gain	26000	29500
BSI Gain	860	1180
Vbatt Offset	2400	2600
Vbatt Gain	10000	11000
Vchar	57000	63000
Ichar	3600	5000

ADC-offset over limits:
Inspect BSI line and components in it (R381, Pull-up resistor R192). If these are OK, change UEM.

BSI Gain over limits:
Inspect BSI line and components in it (R381, Pull-up resistor R192). If these are OK, change UEM.

Vbatt offset and Gain:
Inspect Vbatt lines and component in it.

Vchar over limits:

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Inspect components which are connected Vchar line: F380, L380 and V380.

Ichar over limits:
Inspect components which are connected at Vchar line. If those are OK, First change current sense resistor (R190), if calibration is not still successful change UEM.

Calibration can be checked using ADC-readings. Known voltages, currents and resistances are fed and read by ADC-readings, read values and known values can be compared.

ADC-reading

Divided and scaled battery voltage, Charger voltage, Charger current, BSI and Btemp values can be read by this tool. Read values few times before you can be sure that results are accurate.

NOTE: IF Vbatt Scaled and Divided unit results are different default calibration values are used. In this case perform EM-calibration to get full performance of phone.

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Maximum tolerances are:

Reading	Check point	Tolerance
Vbatt SCAL_	4.2V	± 25mV
Vchar	8.4V	± 40mV
Ichar	500mA	± 20mA
BSI	91k	± 1.3kohm
Btemp	47k	± 5% <+25°C

Backup battery

Symptom of backup battery fault is

Real Time Clock loses the correct time during short main battery removal.

The same symptom can also be seen when the backup battery is empty. About 5 hours is needed to fully charge the backup battery in the device. NOTE: Backup battery is charged only the same time with main battery charging. Or when the device is LOCAL or TEST mode.

Always check the backup battery visually for any leakage or any other visual defect.

Check that the backup battery is correctly mounted in the device before closing the cover.

Check with Phoenix that backup battery is OK

Measure the voltage of backup battery

- Normal operation when the voltage is > 2.0V
- Fully charged when the voltage is about 3.2V (because of large internal impedance voltage won't stay above 3.0V a long time after charging is disabled)

Enable backup battery charging (start to charge main battery or boot device to LOCAL or TEST mode)

Measure voltage of backup battery during charging, It should arise if it is not 3.2V, yet.

When the voltage is over 2.0V for sure, check backup battery with Phoenix.
-> If not OK then D190 is faulty.

Ensure that the RTC is running.

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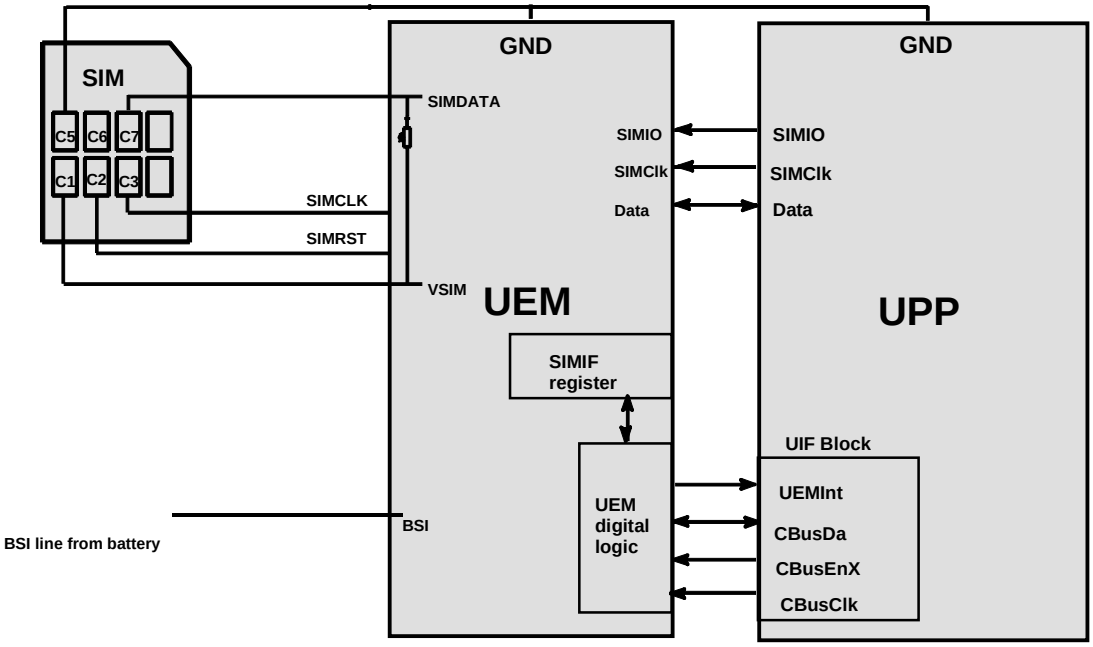
SIM card

The whole SIM interface locates in two chips UPP_WD2 and UEM. UEM contains the SIM interface logic level shifting. UPP provides SIMClk through UEM to the SIM. SIM interface supports both 3 V and 1.8 V SIMs.

UPP & UEM SIM connections



The SIM power up/down sequence is generated in the UEM. This means that the UEM generates the RST signal to the SIM. Also the SIMCardDet signal is connected to UEM. The card detection is taken from the BSI signal, which detects the removal of the battery. Monitoring of the BSI signal is done by a comparator inside UEM. The threshold voltage is calculated from the battery size specifications.

The SIM interface is powered up when the SIMCardDet signal indicates "card in". This signal is derived from the BSI signal. SW tries first to power up the SIM with 1.8 V. If this doesn't succeed power up is repeated with VSIM switched to 3 V.

The data communication between the card and the phone is asynchronous half duplex. The clock supplied to the card is in GSM system 1.083 MHz or 3.25 MHz. The data baudrate is SIM card clock frequency divided by 372 (by default), 64, 32 or 16.

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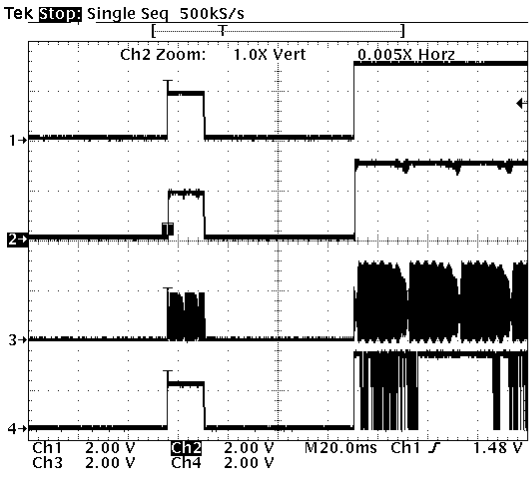
Figure 3: SIM Power Up.



Ch1 Vsim
Ch2 Reset
Ch3 Clock
Ch4 I/O

Measured with 3Vsim

Figure 4: SIM answer to reset.

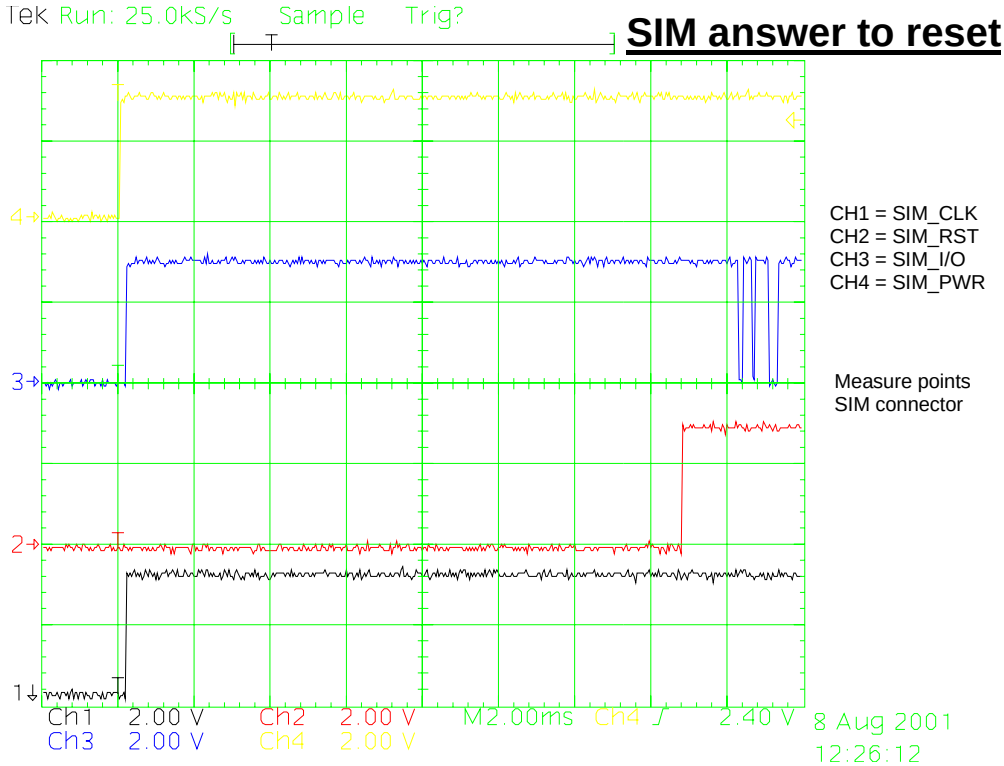


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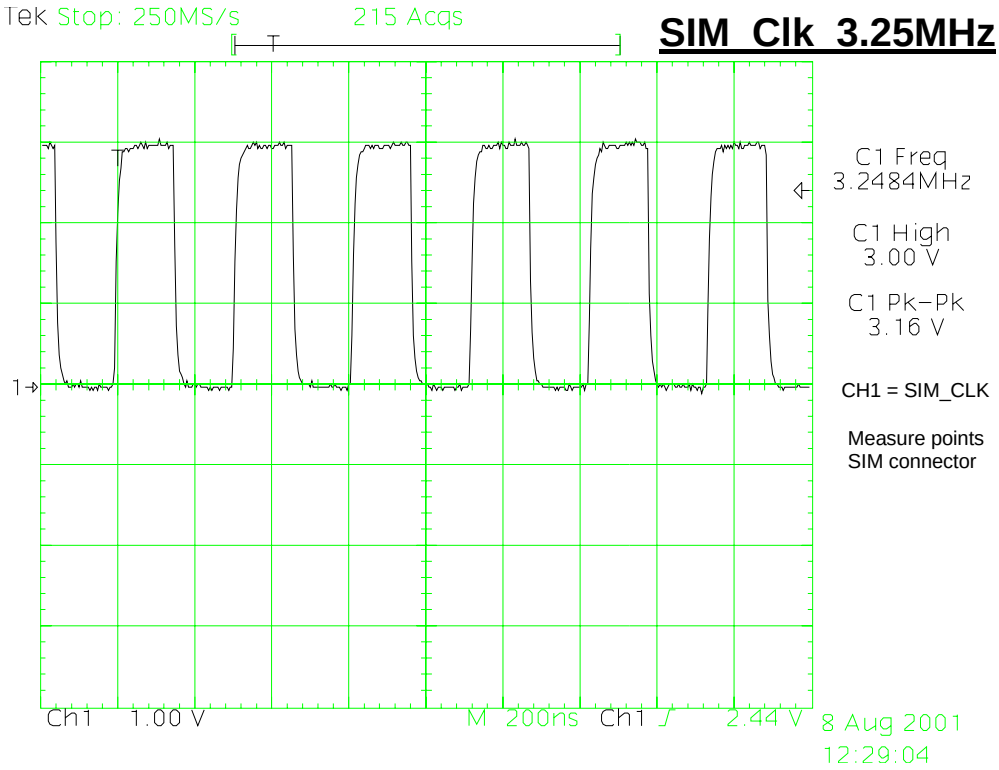
Figure 5: SIM Clk 3.25MHz.



Remember to check the two PHOENIX test cases before changing UPP!!!!

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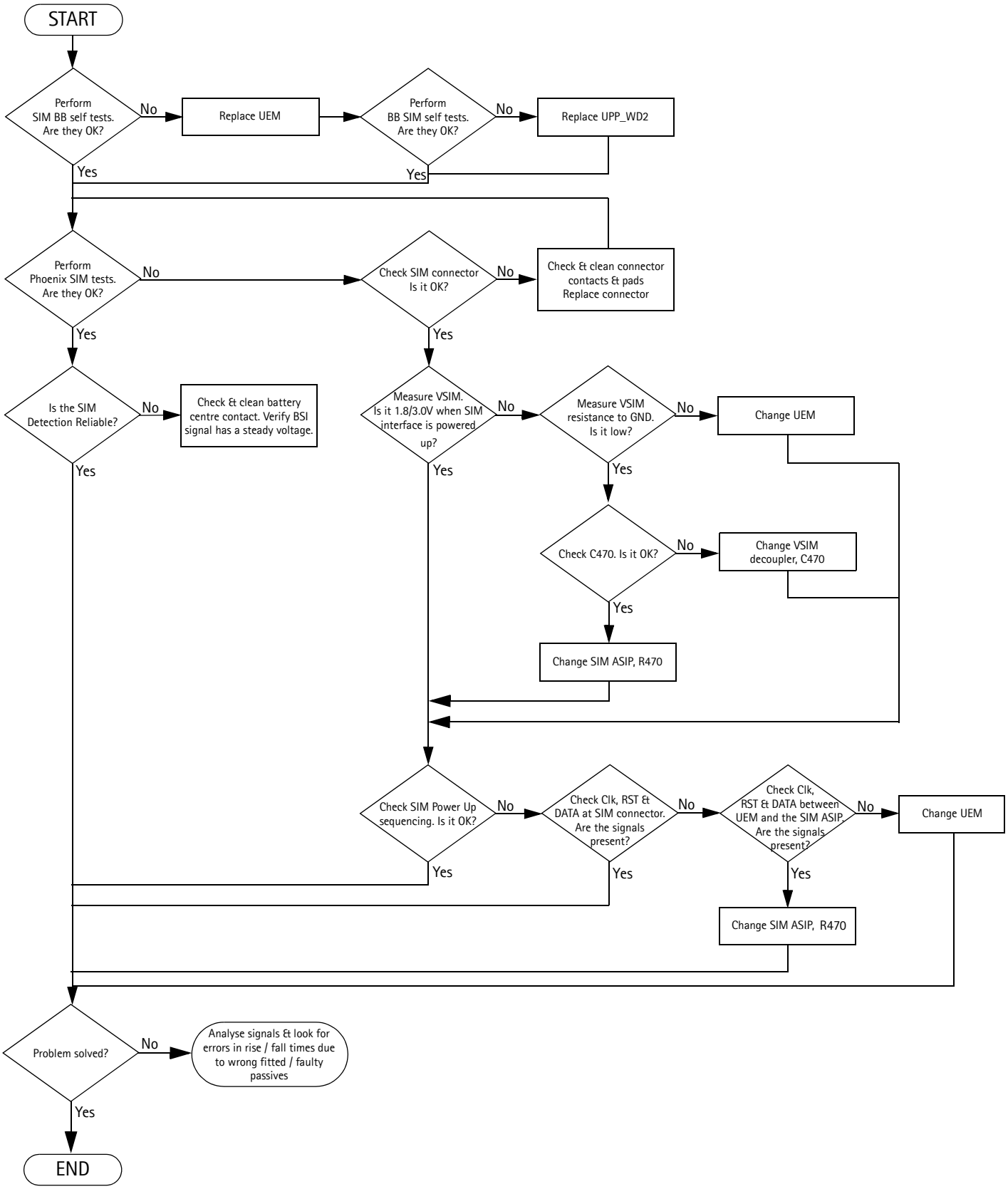
"Insert SIM Card" in device display although card is inserted



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Memory troubleshooting

Most memory related errors are found through flashing the device, flashing the device is therefore recommended before any of the steps described in this chapter. Check flashing troubleshooting section first.

There are however a few memory related errors that cannot be found through flashing.

- - SDRAM(D310) partially damaged. This can mean that the SDRAM component itself is partially damaged and all the memory locations cannot be successfully read or there is a soldering problem somewhere either under UPP or SDRAM. There is a BB self test for testing SDRAM component quite thoroughly, but the problem is that if SDRAM doesn't function properly one may not be able to run those tests as SDRAM is used during the device boot and self-test cannot be run if the device hasn't booted.

- DEVICE may inform about being "out of memory " more often than it should

- - flash1 (D312) is partially/totally damaged. During flashing the manufacturer, device and revision id's are read, but flashing is done based on id's of the flash0 (D311). This means that one cannot see any error messages displayed on Phoenix window during flashing if flash1 is failing. Id's are however displayed on the Phoenix window and successful read of flash1 id's can be checked from there.

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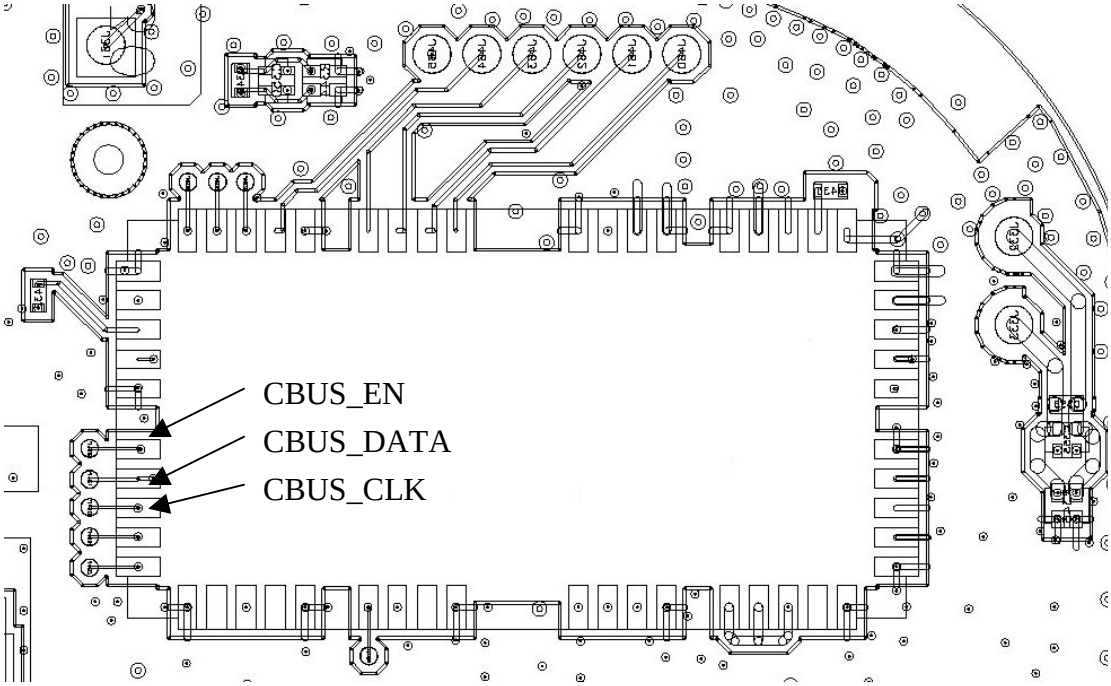
Serial interface troubleshooting

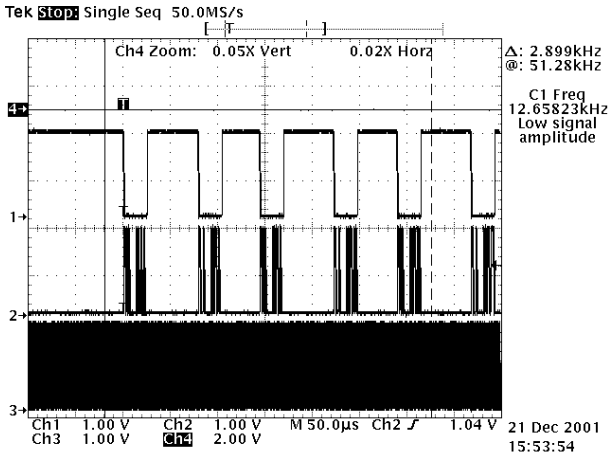
CBUS

CBUS is a three wire serial interface between the main baseband components. The bus consists of data, clock and bus_enable signals. In RH-29 the bus is connected from UPP WD2 to ZOCUS, UEM and LPRF. UPP_WD2 takes care of controlling the traffic on the bus.

If the interface is faulty from the UPP WD2's end the phone won't boot properly as powering configurations don't work. Traffic on the bus can be monitored from three pins on the LPRF module. Pins 34, 35 and 36.

In the pictures below CBUS traffic at boot up is shown. CbusEnx is connected to Ch1, Cbus Da to Ch2 and CbusClk to Ch3.





If however you are able to get the phone to boot up and can reach Phoenix BB self tests it is possible to test the functionality of each component attached to Cbus. Use

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ST_ZOCUS_CBUS_IF_TEST to test AEM Cbus interface

ST_UEM_CBUS_IF_TEST to test UEM Cbus interface

ST_LPRF_IF_TEST to test Bluetooth Cbus interface

If an error is found testing any of the above components you should replace the failing component.

FBUS

FBUS is a two wire RX and TX interface between UPP and flash/test interface. The bus goes through UEM which adjusts the voltage levels to suit UPP_WD2. The interface voltage level on the phone flash/test pad pattern is 2.78V and on the UPP WD2 end it is 1.8V. The functionality of this interface should not affect the device boot into NORMAL, LOCAL nor TEST modes. Phoenix tests can be performed through MBUS interface in the case of a failure in FBUS interface. Flashing is not possible if there is a problem in FBUS.

MBUS

MBUS is a two wire RX and TX interface between UPP and UEM. From UEM the interface continues to flash/test interface as a one wire interface. UEM also adjusts the voltage levels. The interface voltage level on the phone flash/test pad pattern is 2.78V and on the UPP WD2 end it is 1.8V. MBUS traffic between UPP WD2 and UEM can be tested with PHOENIX (ST_MBUS_RX_TX_LOOP_TEST). Flashing is not possible if there is a problem in MBUS.

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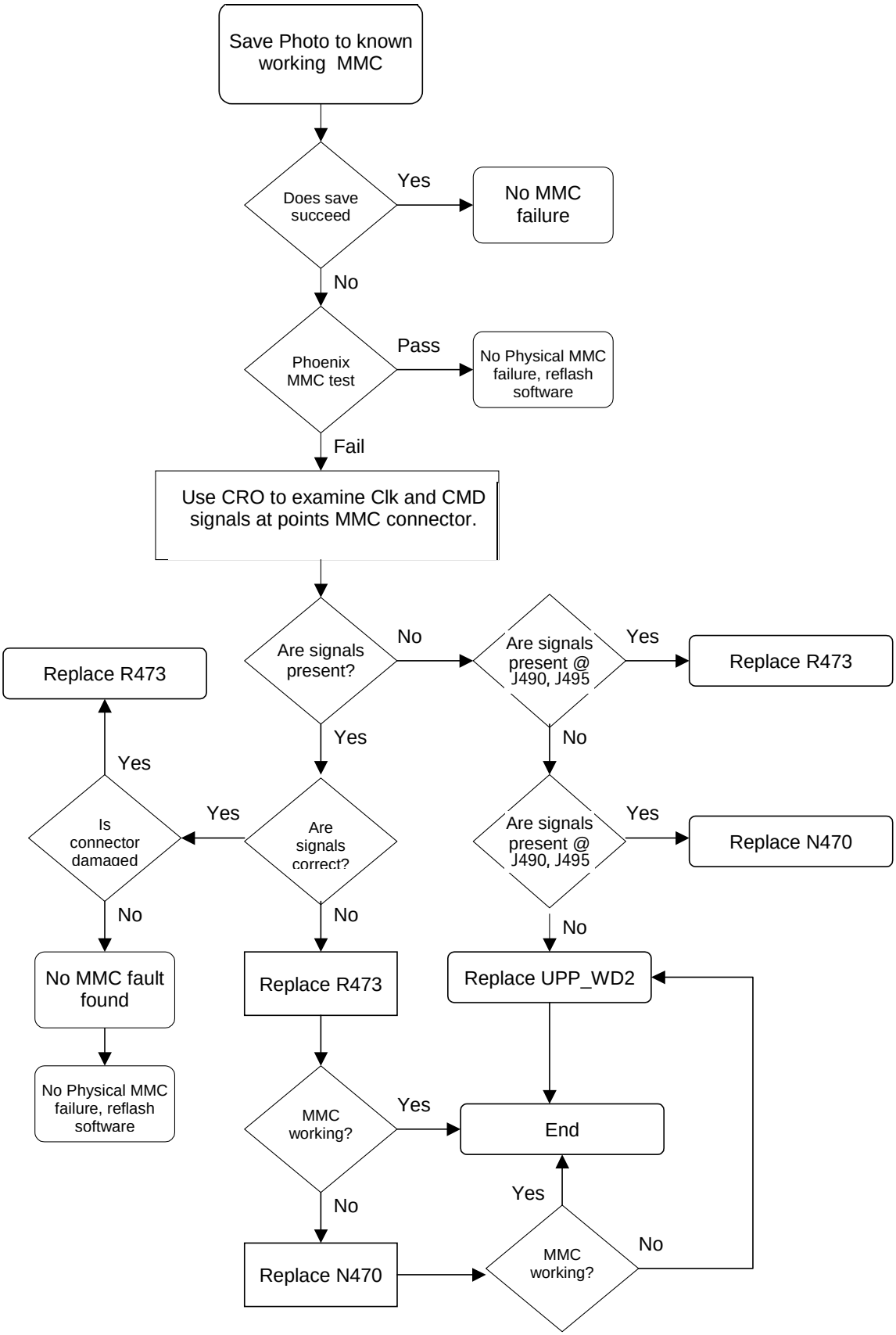
MMC troubleshooting



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Vibra

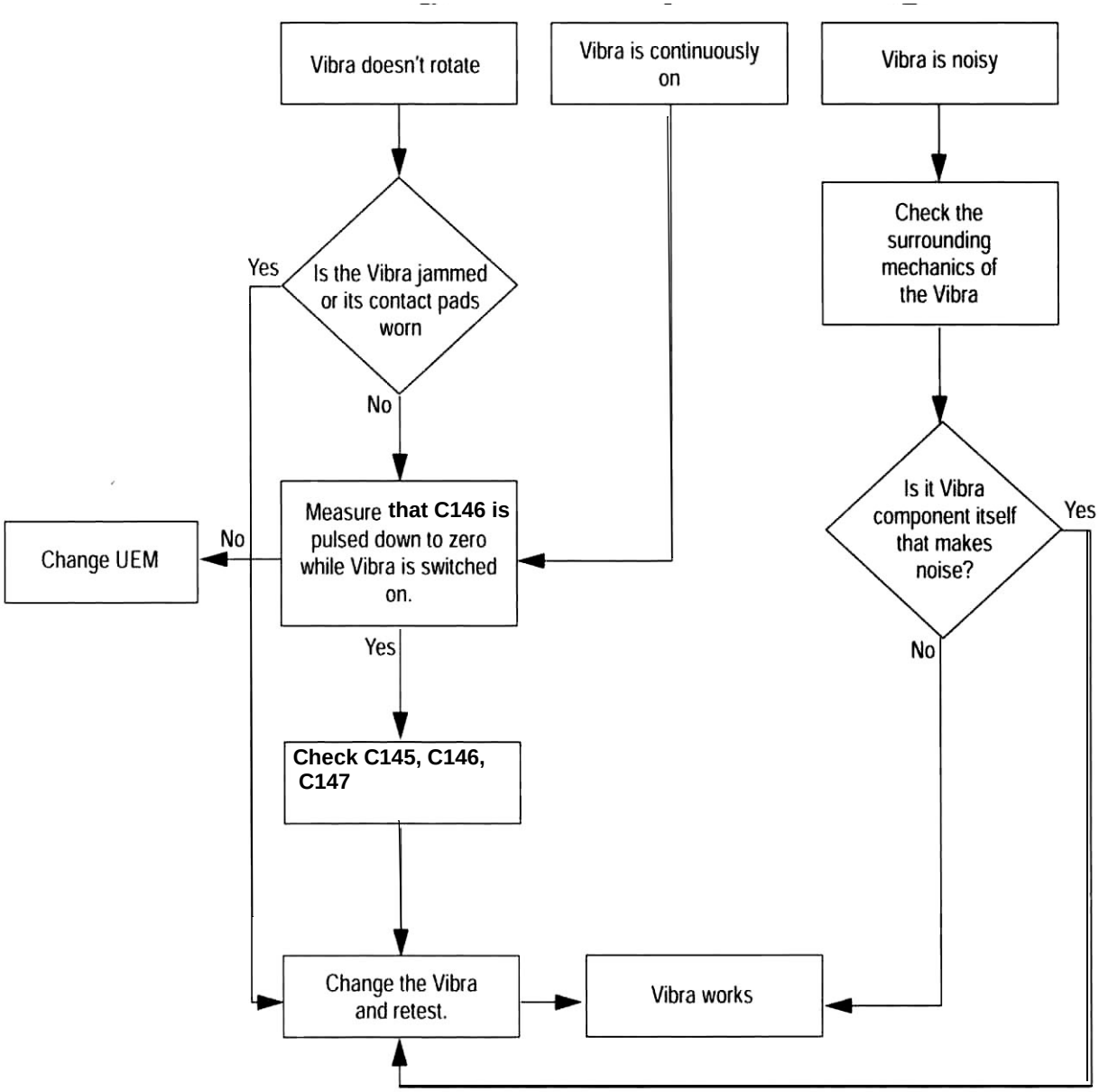
There may be three kinds of problems with the vibra:

- it does not rotate

- It is noisy

- it is continuously on

Noisiness is usually caused by the contact of the rotating mass with surrounding mechanics.



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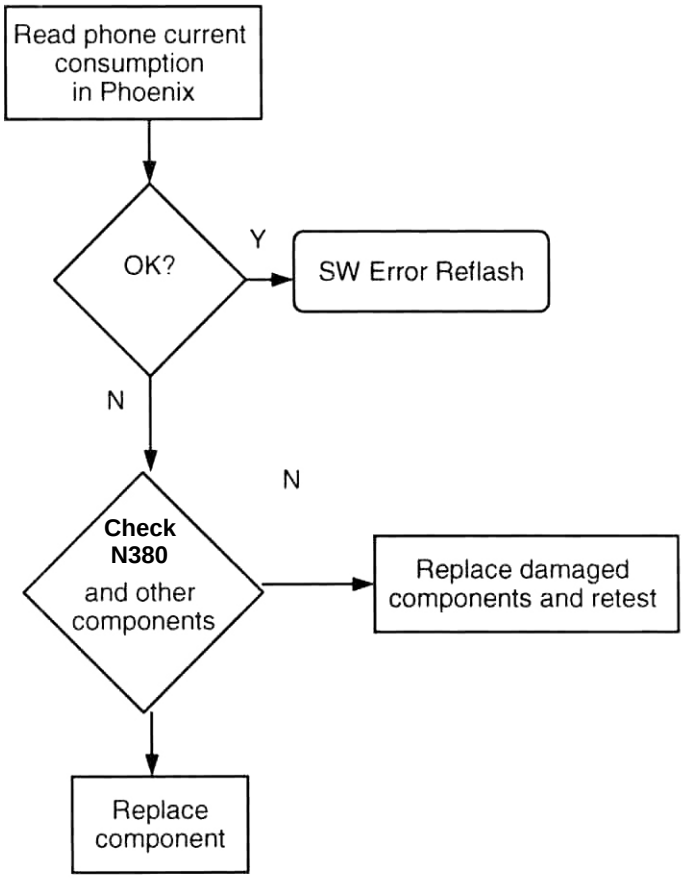
ZOCUS



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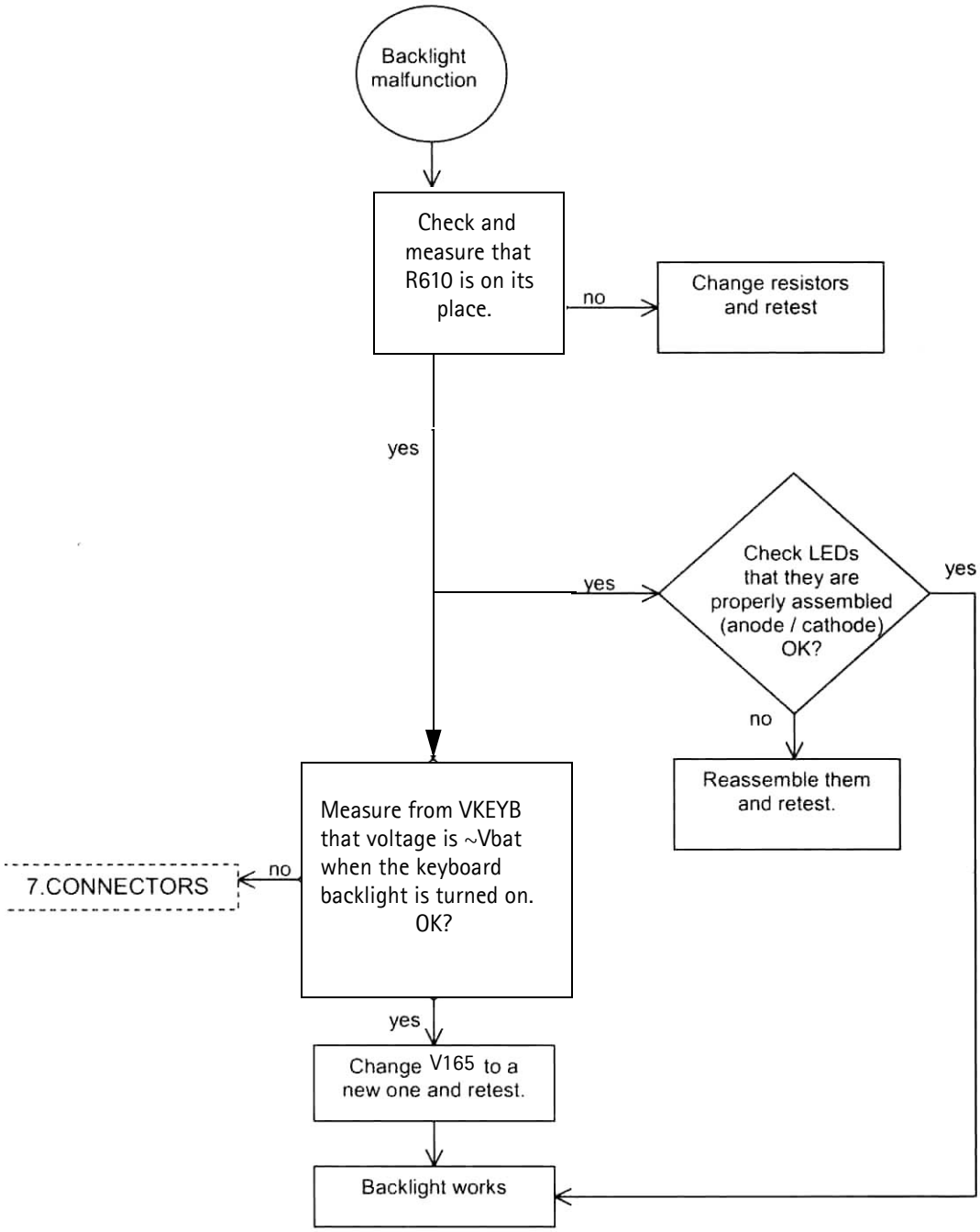
UI Module Troubleshooting

This document describes the troubleshooting of the UI module

If the problem is in the display or in the keymat PWB the entire UI module must be replaced. However, the earpiece may be replaced (see audio troubleshooting).

Keymat backlight

If the keymat backlight is not functioning and the backlight driver voltage is generated correctly on the 1CK module, then the problem is either in the connector or the UI module. Note that it is possible that one LED is dead while all others are working.



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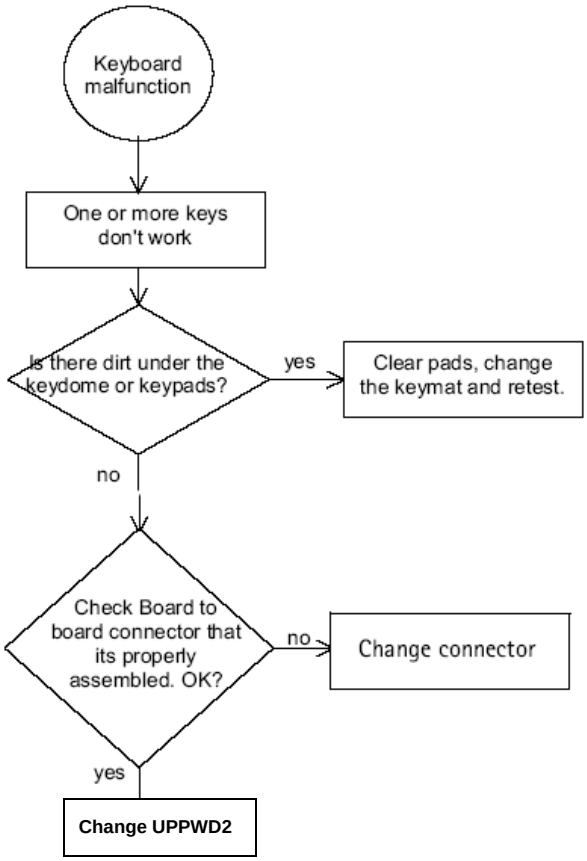
Keyboard problem

If the keyboard does not work, follow the troubleshooting chart below:



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Display blank

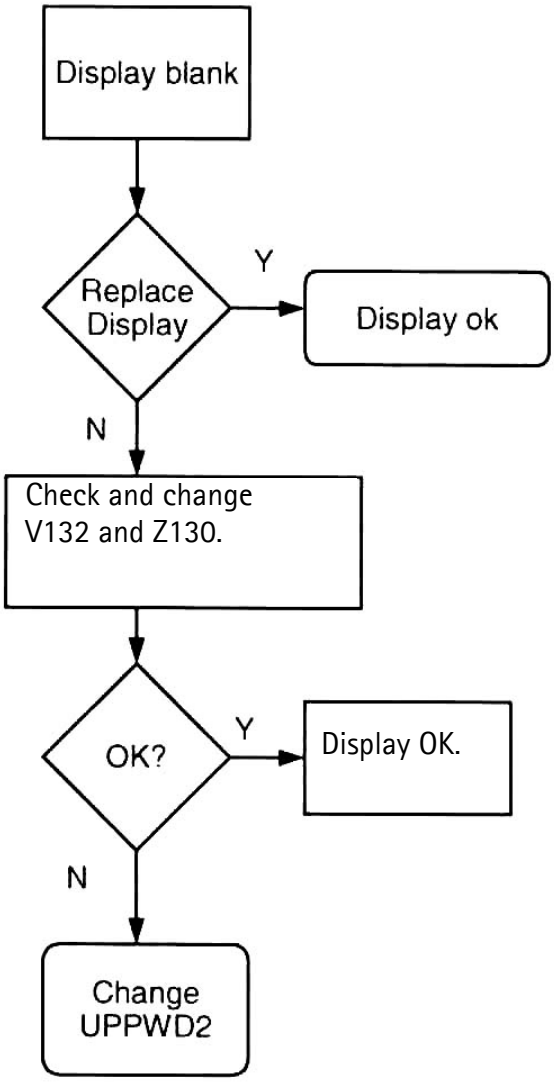

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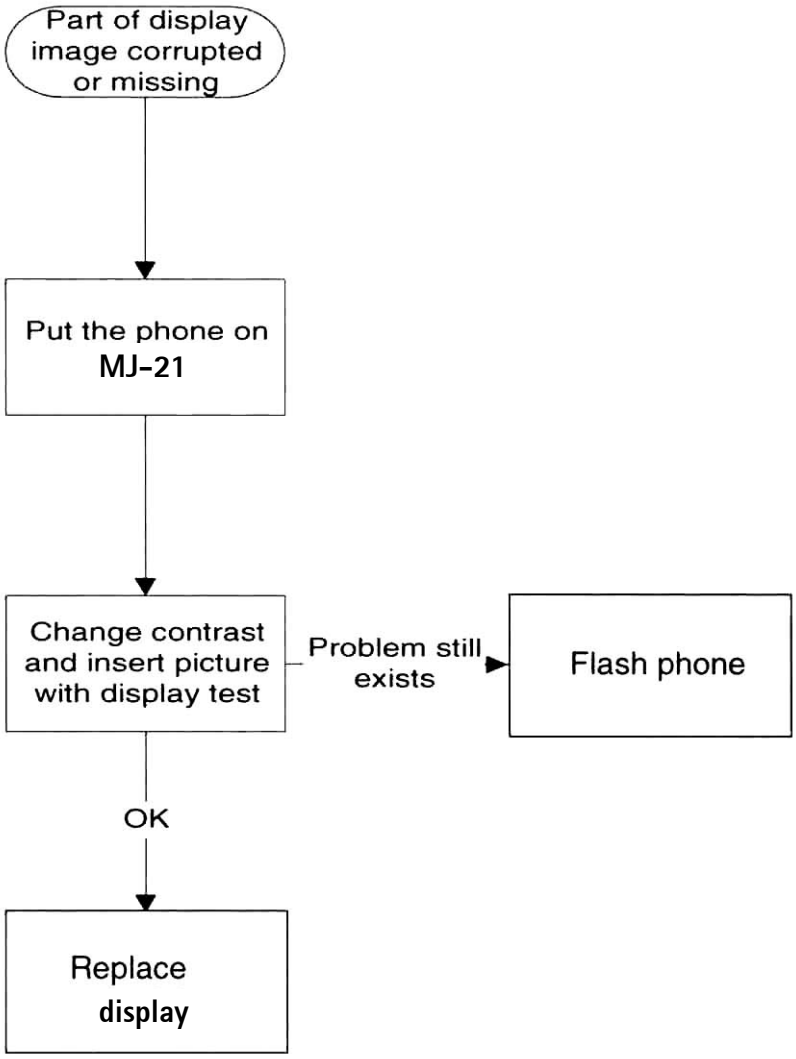
Image on display not correct



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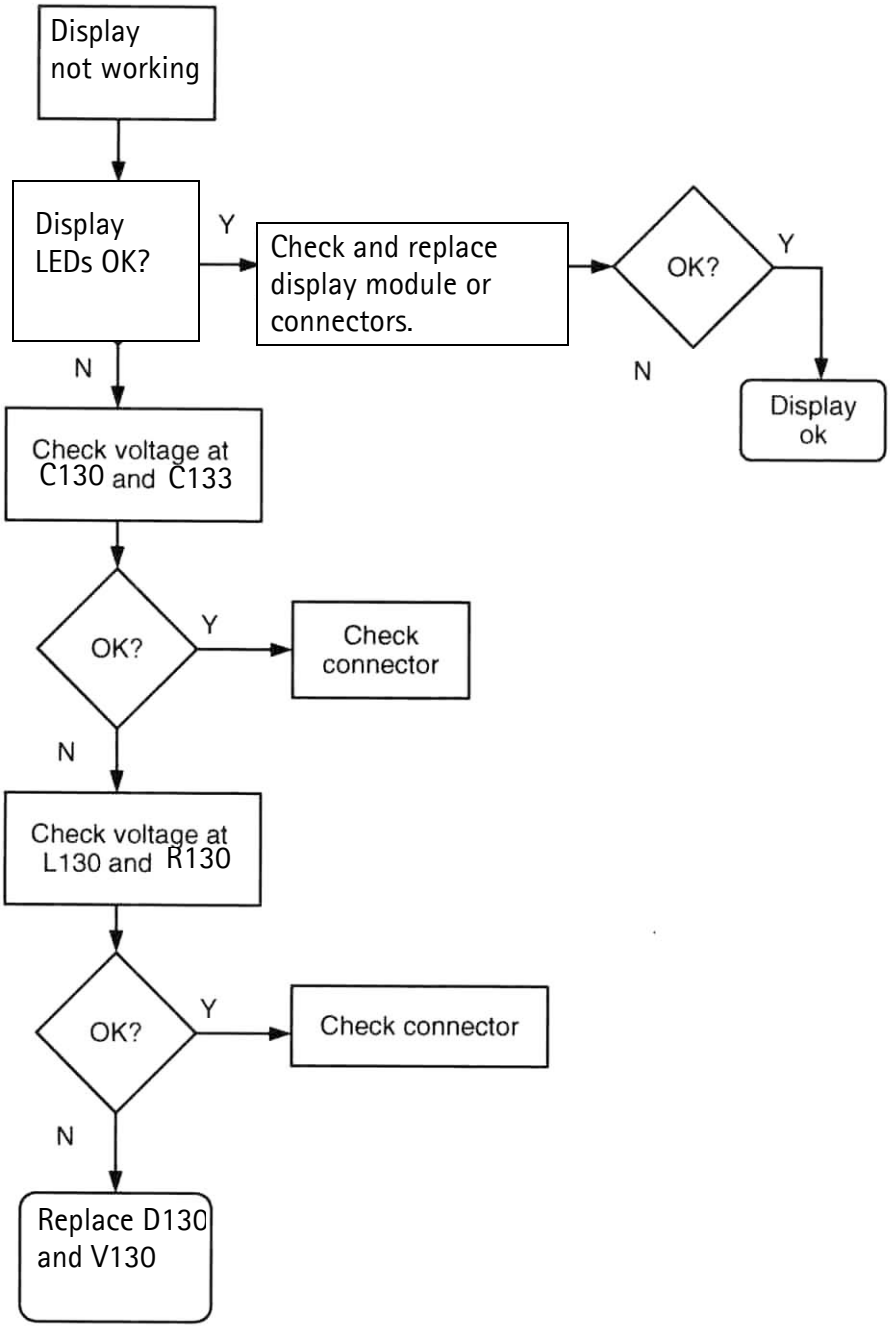
Display backlight does not turn on



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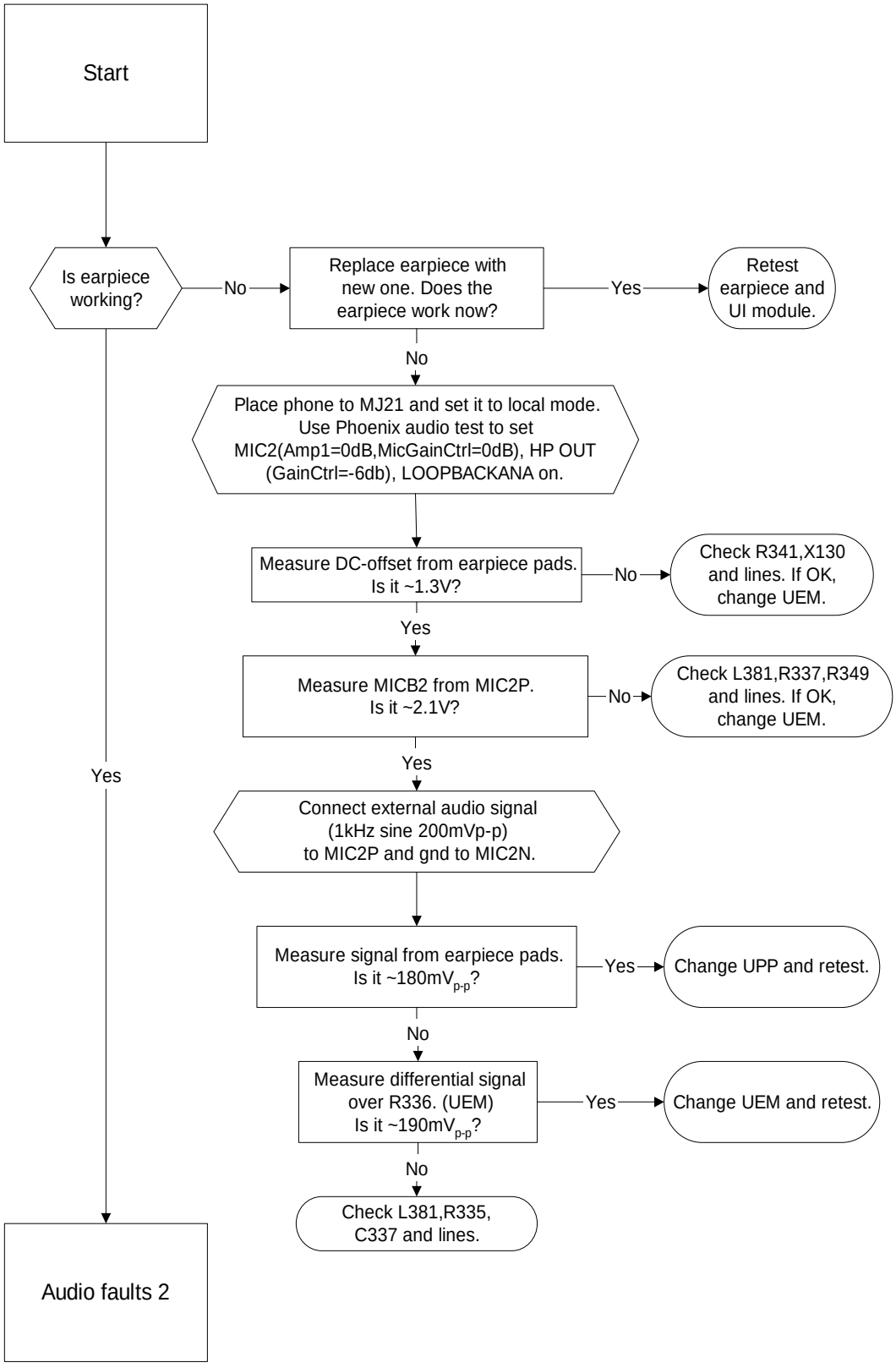
Hand portable audio



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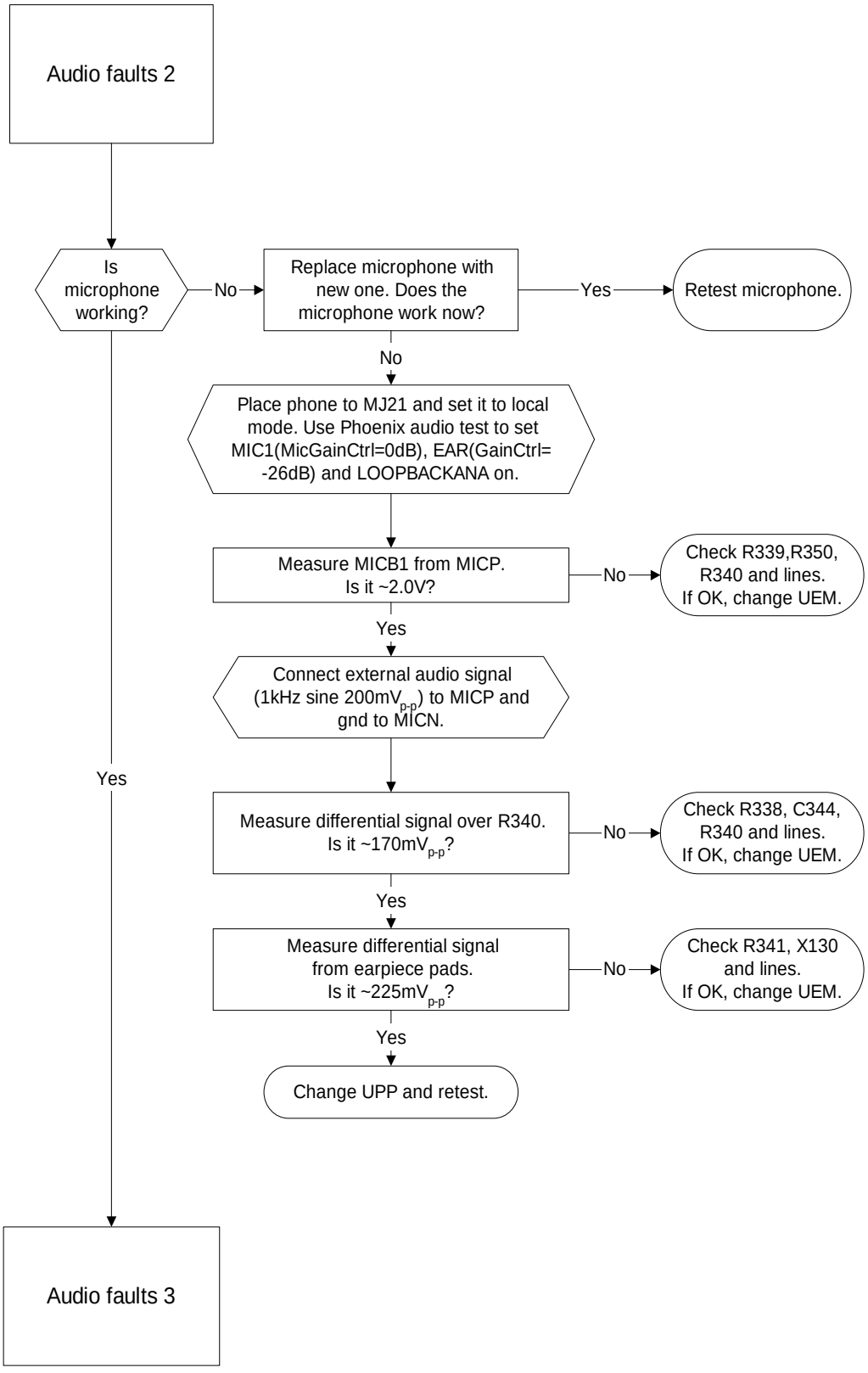

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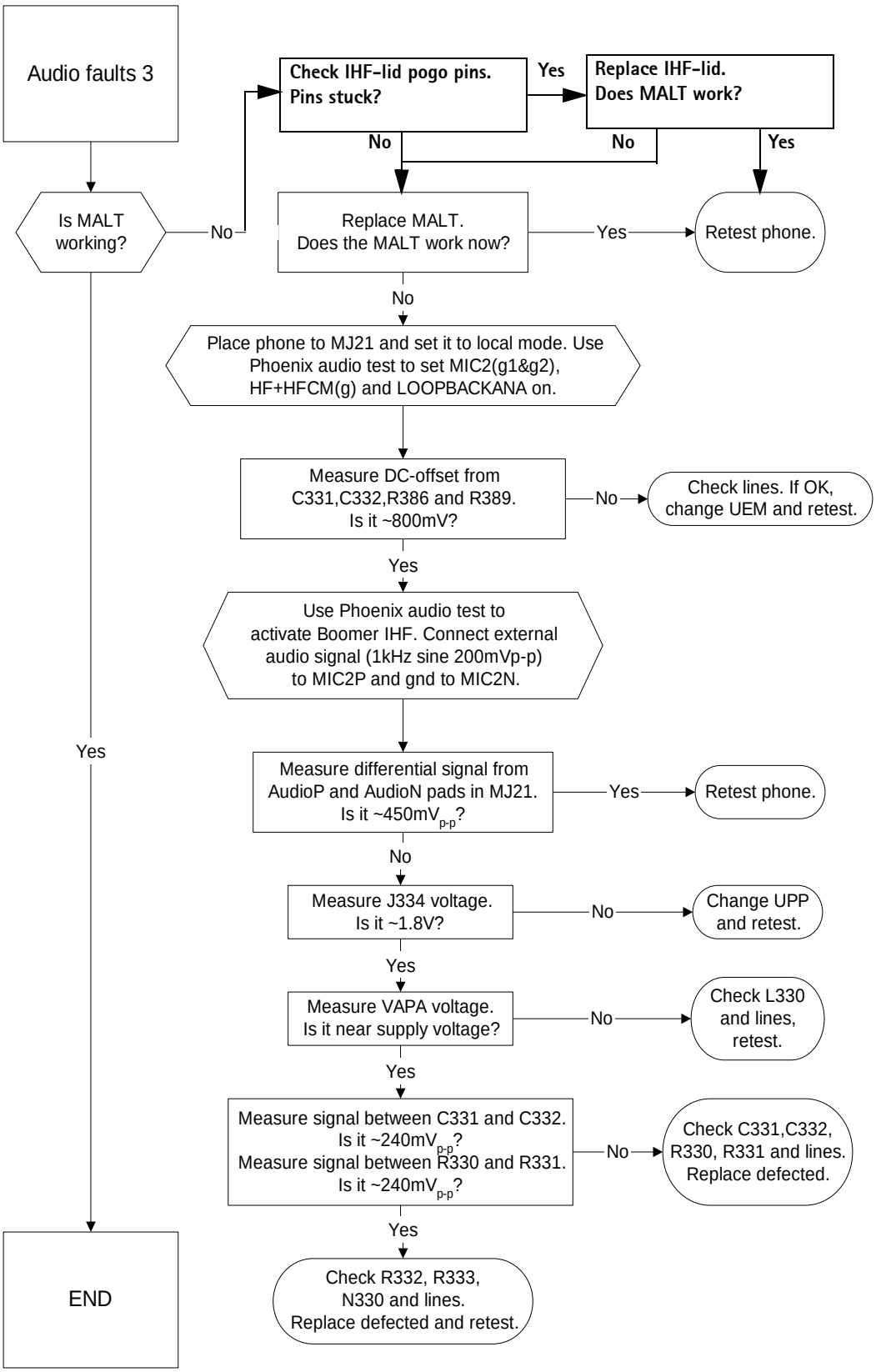

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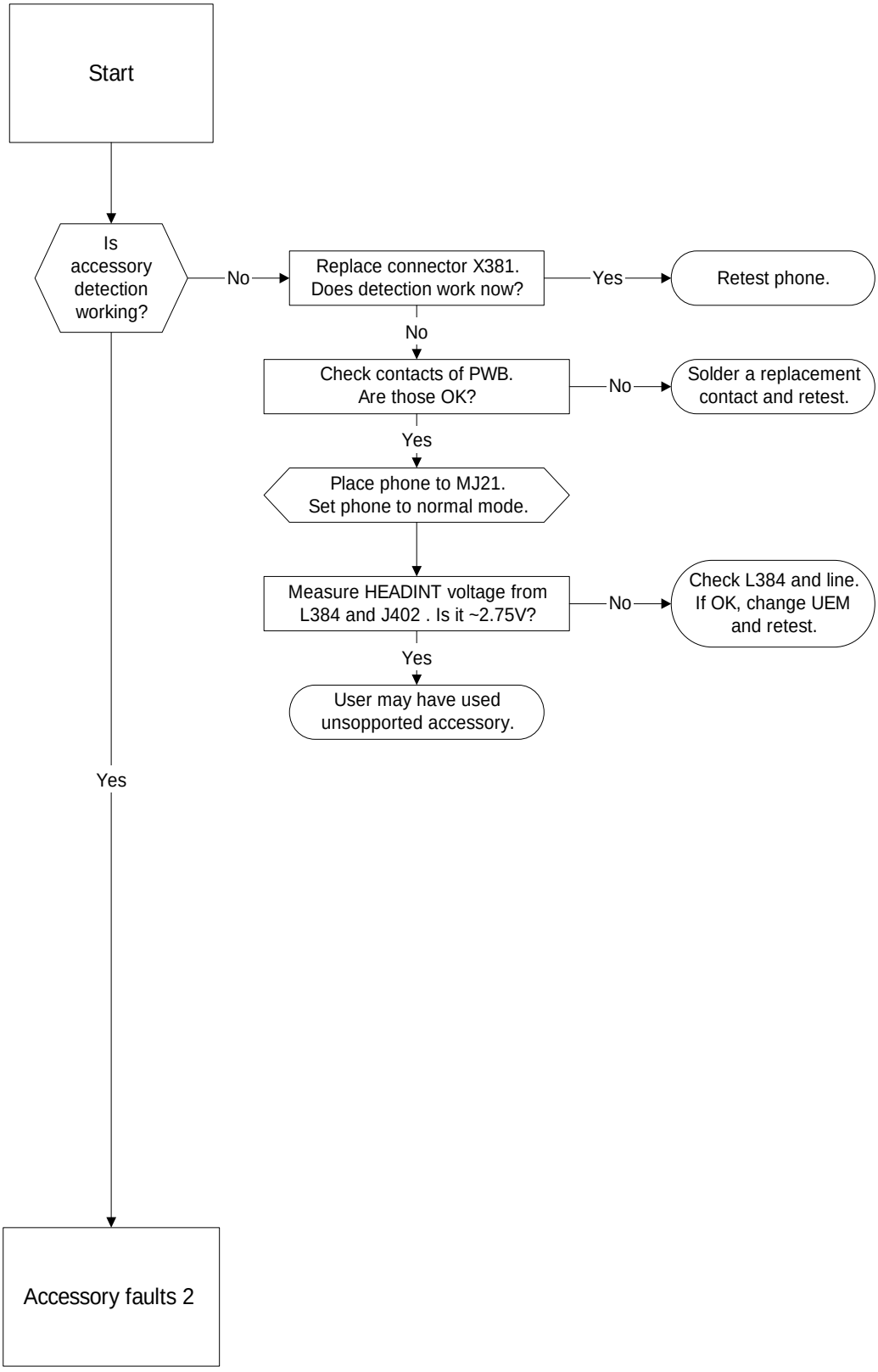
Accessory Audio



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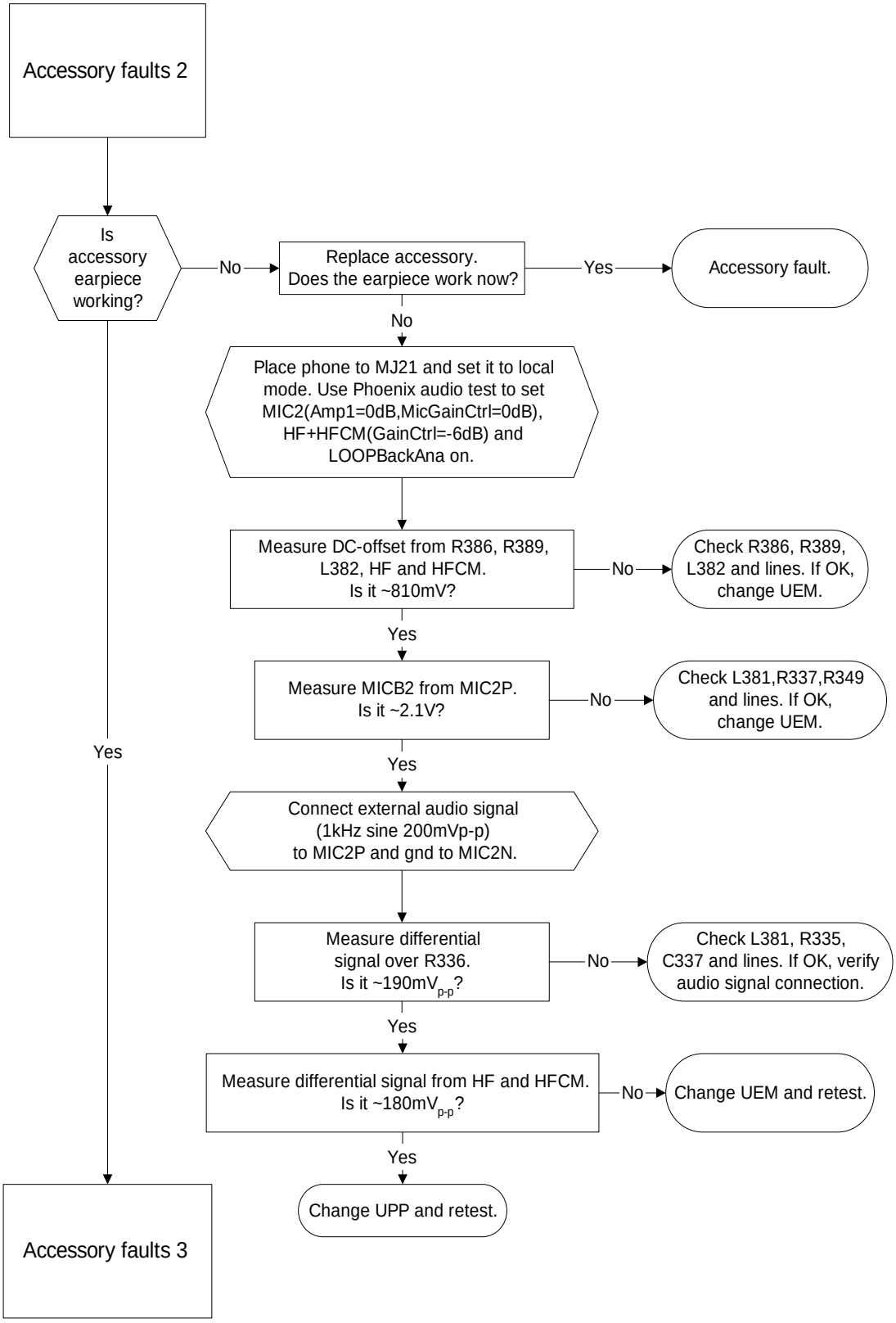

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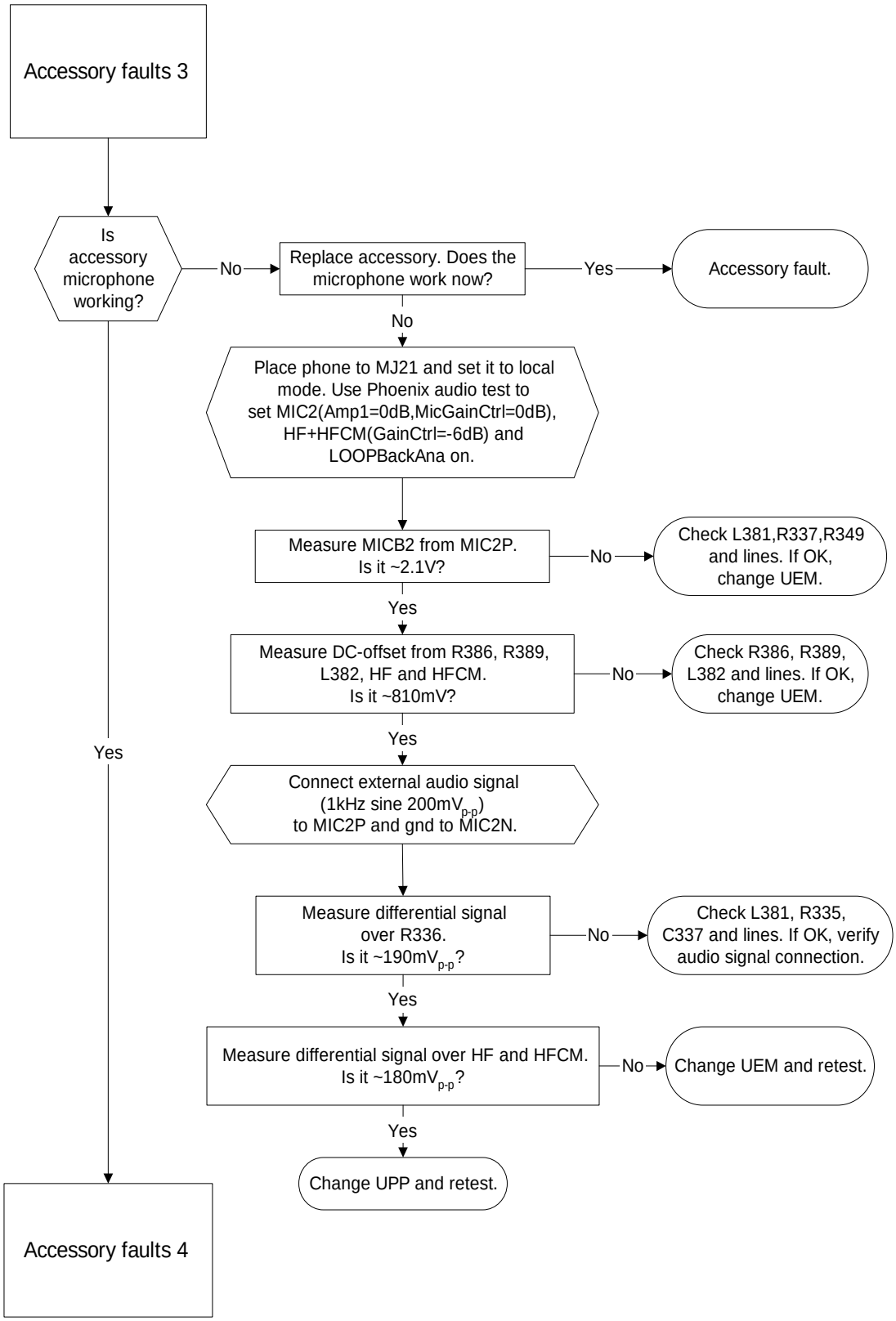

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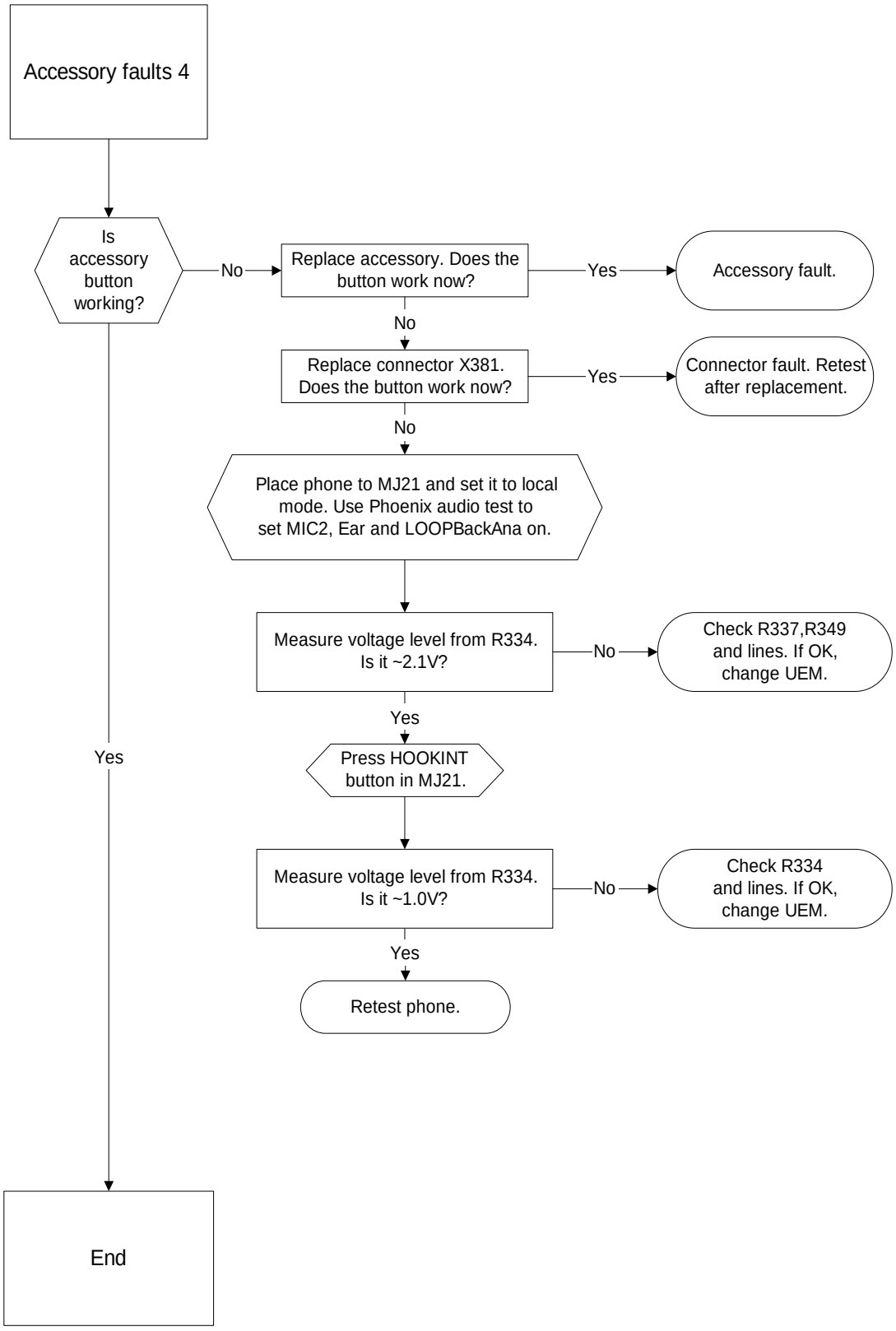

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